Semitic Music Theory

(from its earliest sources till the dawn of Christianity)

Richard Dumbrill

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INTRODUCTION

My decision to entitle this book *Semitic Music Theory* is self-evident since the texts analysed in the following chapters have all been written mostly with Semitic languages, mainly Akkadian, and by Semitic peoples, with the exception of some Sumerian and Hurrian inclusions.

Sumerian is not a Semitic language but it would have been exclusively written by Semitic peoples after the fall of the Sumerian dynasties. The Hurrians of Ugarit would have blended into the Babylonian society after a couple of centuries of residence at Ras al-Shamra and used Babylonian along their own agglutinative language. Comparably, the Latin practicing clergy is not necessarily Roman.

The period covered in this book begins with the advent of writing, around 3,200 years BC, and ends with its evanescence in the first or second century of our era. The geographic setting is roughly comparable to the boundaries of the modern Middle-East and comprises contiguous regions of limitrophe states.

Ancient Egypt is not included since the country has not yet produced any music treatises. Additionally, the Biblical recital is excluded for I rely only on cuneiform clay tablets found in archaeological contexts, on iconographic evidence and meagre remains of excavated instruments.

The cuneiform texts which form the body of this work are the oldest and only textual evidence attesting of a cogent music theory, anywhere in the world. Some of these manuscripts were acquired from reputable, and sometimes from less reputable dealers, at the end of the nineteenth century, but in most cases, their dating and origins can be scientifically established on the bases of epigraphy, orthography and philology.

Babylonian scholarship spread to Greece from the late eighth century BC, during the Orientalizing Period, and then metastasised into the Roman Empire. It reached Western shores after the looting of libraries of the Levant during Urbain II's first crusade in the late eleventh century, and later campaigns. Meanwhile, the earliest codex preserving Ancient Greek music theory was collated on the west bank of the Tigris, in Mesopotamia, on the fourteenth of January 1040 of our era by a scribe aptly responding to the name of Nikolaos Kalligraphos. The manuscript is hosted at the University of Heidelberg as *Heidelbergensis Palatinus gr.* 281.

What is called 'modal music', contentiously, remained a quintessential Oriental expression the most exquisite development of which reaching its apotheosis with the Maqam form, during the Golden Age of Islam, leaving the West, at the same period, to its slow development of harmony with the École de Notre Dame in Paris from the twelfth century onwards.

The study of Babylonian music theory has been cursed with a series of phantasmagorical interpretations. In 1924[1], the ethnomusicologist Curt Sachs found music in a Babylonian bilingual

1 Sachs, C., *Die Entzifferung einer babylonischen Notenschrift*, (1924), 120 ff.

hymn from a scale which he reconstructed through statistical estimations of syllable frequency. In 1933, Benno Landsberger rejected Sachs' thesis on philological grounds[2]. Then, in 1937, Canon Galpin[3] proposed another interpretation of the same syllables and was outlived by his aberration immortalized in the 1968 *Encyclopédie des Musiques sacrées*[4]. Then, in the nineteen-sixties, with the emergence of newly discovered cuneiform texts, a second wave of obnubilating interpretations of Babylonian music theory backwashed against musicological rationality until this day, by ignorance, it is hoped, as if it were by intent, it would expose a continuance of the most hideous of Western supremacism.

Richard Dumbrill 2019

Acknowledgements

I am greatly indebted to my good friend and colleague Dr Irving Finkel of the British Museum for his most pertinent help with the intricacies of the Akkadian language which he masters with an extraordinary ability as if his sight had been gifted with some kind of x-ray device allowing him to dig right down into the deepest furrows of the clay to reveal what no one else can see.

RD

2 Landsberger, B., Die angebliche babylonische Notenschrift. *Archiv für Orientforschung* 1, (1933), 170-8.
3 Galpin, F.W., *The Music of the Sumerians. . .* (1937), 99-104 and Plate IX, p 69.
4 Statlender, R., *Encyclopédie des Musiques sacrées Sumer et Babylone.* (1968), 303-9.

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U.3011

(*nabnītu* xxxii/[**SIG$_7$**] **ALAM** = UET VII, 126)

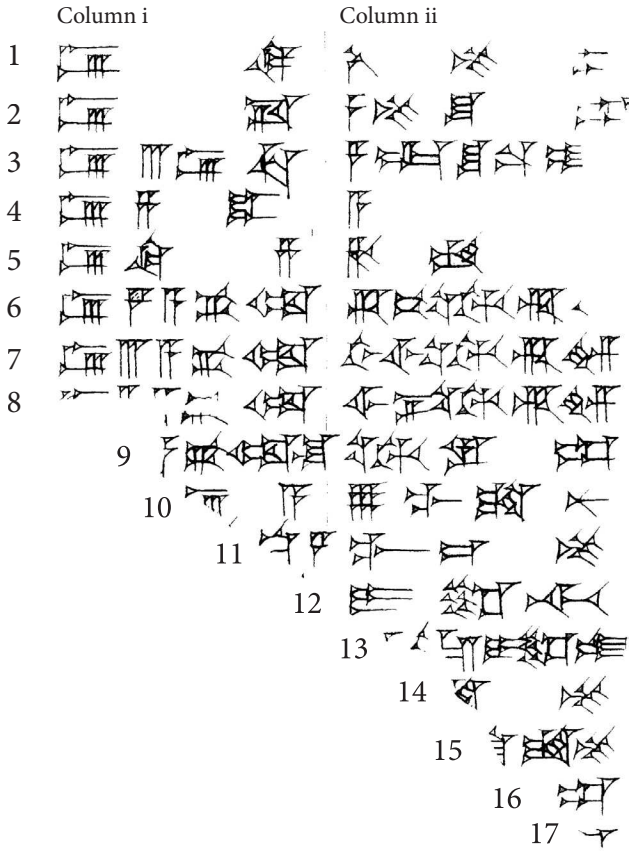


Figure 1. Detail of U.3011. After Gurney's hand copy of the left column of the tablet[1].

This cuneiform text is better known as *nabnītu* xxxii since it is the thirty-second tablet of a well-known bilingual Sumerian and Akkadian lexical series. Akkadian *nabnītu* (written [**SIG$_7$**] **ALAM** in Sumerian = *nab-ni-tum*[2], in Akkadian syllables), means 'offspring', 'progeny' or 'product'[3]. U.3011 is its field number. It is also known as *UET* VII, 126, and was published in Professor Gurney's volume VII of the *Ur Excavation Texts*, Plate 126. Copies would have been distributed widely, during a number of centuries, in

1 The tablet is published in *Ur Excavations Texts. Publications of the joint expedition of the British Museum and of the University Museum of the University of Pennsylvania, Philadelphia, to Mesopotamia. Volume VII, Middle Babylonian Legal Documents and other Texts.* Oliver R. Gurney. (1973). Note the lacuna in L.4 Col.2. This was later corrected in *IRAQ* XLVI 82, note 1.

2 Some Akkadian words end with either *um*; *am* or *im* and others with *u*; *a* or *i*. The addition of a final '*m*' is called the mimation and is usually characteristic, but not exclusively, of Old Babylonian epigraphy.

3 *Chicago Assyrian Dictionary* (*CAD*), vol. 'n', p. 27.

the various kingdoms and provinces of Mesopotamia, as it was certainly a type of encyclopedia essential to scholarly institutions, temples and palaces.

Sir Leonard Woolley (1880-1960) found the tablet in the *Dublamaḫ*, south of the main courtyard in the late nineteen-twenties. It was returned to the Iraqi Museum, Baghdad, in the nineteen-seventies. Its condition is at present unknown. The text is Neo-Babylonian, about 800 BC, but it is most probably the copy of an older document or of an older concept, and possibly of both.

The tablet lists the strings of an archetypal lyre[4] fitted with nine strings. Such instruments with large numbers of strings were common in the iconography around 3200 to 2600 BC. Yet, they had all but disappeared by the time the present text was written. This suggests that the terminology and its underlying theory, not only had survived, but was still taught about two millennia after its original conceptualisation and that it gathered crucial innovations in the course of time. These innovations are perceptible from philological differences between the Sumerian and the Akkadian text.

Therefore, a scrutiny into these linguistic variations is essential before discussing the issuing musicological significance of the document.

1) The Akkadian is partly but not entirely a literal translation of the Sumerian which would have chronological conceptual precedence.

2) The Sumerian entries are not analytical but are the names and locations of nine strings, in a consecutive order which we assume is systemic.

3) There appears to be a tonal relationship between lines 1, 5 and 9, principally and with other lines, secondarily.

4) Sumerian lines 9 to 5 stand in symmetry with lines 5 to 1 while Akkadian lines indicate variations to the symmetry of the Sumerian.

5) *qud-mu-um*[5], in line 1, would be the adjective *qudmû*, meaning 'prime', rather that the noun.

6) Similarly, *šá-mu-šu-um* would stand for the adjective *šamušû*, 'neighbouring', understanding Sumerian **sa-uš** as **sa-ús**, the underlying Akkadian verb being *emēdu*.

7) Therefore, *úḫ-ru-um* in line 9 would be the adjective *uḫrû*, rather that the noun *uḫru*, 'rear' as found in lines 6 to 8.

Transliteration and literal translation of the Sumerian and Akkadian entries

Column i		Column ii	
Sumerian	**Translation**	**Akkadian**	**Translation**
1 **sa-di**	string **DI** prime (?)	*qud-mu-*⌜*um*⌝	prime(?) (string)
2 **sa-ús**	string neighbouring	*šá-mu-šu-um*	neighbouring (string)
3 **sa-3-sa-sig**	string 3 string thin	*šá-al-šu qa-a*[*t-nu*]	third (string) thin
4 **sa-4-tur**	string 4 small	**A**-[**DÙ**]	Ea-banû Ea-the creator
5 **sa-di-***5	string **DI** prime (5)	*ḫa-am-*[*šu*]	prime(?) (fifth string)
6 **sa-4-a-ga-gul**	string 4 rear	*ri-bi úḫ-ri-i*[*m*]	fourth of the rear (string)
7 **sa-3-a-ga-gul**	string 3 rear	*šal-ši úḫ-ri-im*	third of the rear (string)
8 ⌜**sa-2-a-ga**⌝**-gul**	string 2 rear	*ši-ni úḫ-ri-im*	second of the rear (string)
9 [**sa-1**] ⌜**a**⌝**-ga-gul-la**	string 1 rear	*úḫ-ru-um*	rear (string)
10 [**9**] ⌜**sa**⌝**-a**	9 strings	9 *pi-it-nu*	9 strings

4 I assume that it is the strings of a lyre which are described and that this instrument was paradigmatic since most of the theoretical texts up to the late first millennium BC infer an enneachordal instrument, or mention an enneatonic system.

5 Akkadian terms are written in italics while Sumerian is in bold characters.

This text names and locates the nine strings of a lyre. However, it is my contention that these strings were tuned to the pitches of a generative system. Therefore they would be string-pitches[6]. The practice is not unusual as to this day the violin, the guitar and other string instruments name some of their strings from the pitches they sound, *Air on a G string*[7], for instance[8]. Now, Western pitches are named, in their ascending order: tonic, supertonic, mediant, subdominant, dominant, submediant and leading note. These names came from an older scheme where the tonic note was the axis of symmetry of the system. Supertonic and subtonic were, respectively, one step above and one step below the tonic; mediant and submediant were each a third above and below the tonic, and dominant and subdominant were a fifth above and below the tonic. This is why the sixth degree is called the submediant and not the 'superdominant'[9]. Now if dominant and subdominant were a fifth above and below the tonic, this means that the system spanned an enneachord. With the advent of heptatonism, the tonic could not keep its status and shifted to the first pitch of the system.

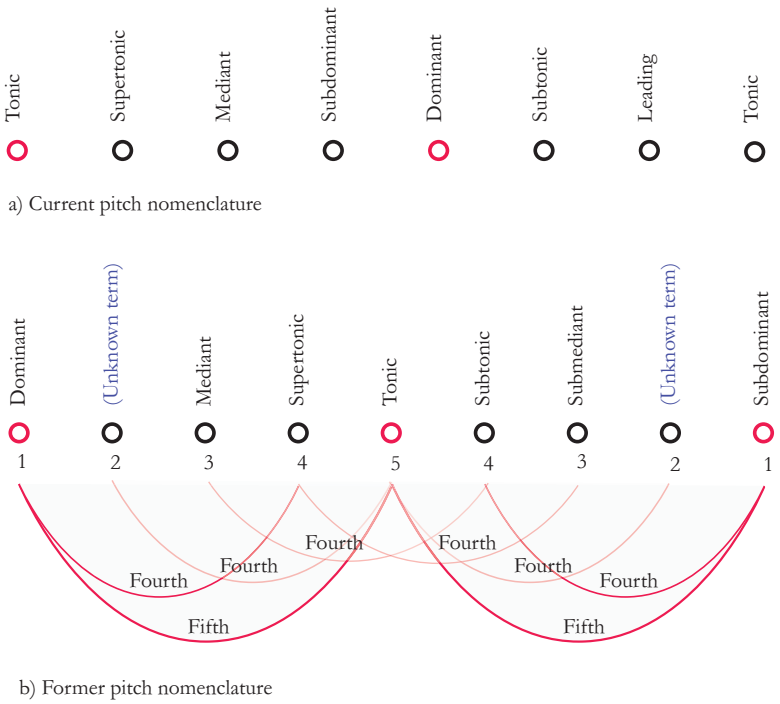


Figure 2. Ancient and modern Western pitch nomenclature.

In figure 2b above, arcs in red indicate intervals of the Just fifth and of the Just fourth from which this series would have been constructed, although there is no evidence that this were the case. However, the hypothesis that U.3011 was constructed from these intervals, exclusively, is a basis from which to start our research until it is possible to refine the system.

6 On a well-designed polychordal instrument, each string has been calculated (or empirically deduced) to produce an ideal pitch, hence the association of a string and its pitch.

7 This '*Air on the G String*' is August Wilhelm's arrangement of the second movement in Johann Sebastian Bach's Orchestral Suite No. 3 in D major, BWV 1068. The arrangement differs from the original in that the part of the first violins is transposed down so that it can be played entirely on a violin's lowest string, i.e., the G string.

8 Note that the first string-pitch of a guitar is treble 'e', while with most other Western instruments, the bass pitch is the first degree. This would suggest the survival of a long gone descending system the genealogy of which originating from the Babylonian *kinnāru*, turning into Hebrew kinnor (כִּנּוֹר) then the Greek *kithara* (κιθάρα) to end up as the Spanish guitar, (guitarra).

9 Although French terminology names the sixth degree 'sus-dominante'.

We note that in figure 2, the Western system, at some point, excluded the second and eighth pitches. However, this second pitch is known to the Ancient Near-Eastern terminology as Sumerian **sa-ús** (around 2600 BC), and as Akkadian *šamušūm* (around 2000 BC), meaning 'neighbouring'. The eighth pitch is **sa-2-a-ga-gul** in Sumerian (around 2600 BC), *ši-ni úḫ-ri-im*, in Akkadian (around 2000 BC). This term re-emerges in Classical Arabian theory as '*mujannab*' meaning 'neighbour'-(string-pitch), from around the tenth century AD onward.

Nine-pitch systems were certainly not unique. In a notoriously difficult passage in *Republic* (545c-546d)[10], Plato writes that the Muses have two harmonies consisting of two Pythagorean heptachords superimposed in such a way that their combination aggregates into an enneachord (Fig. 3). Later, Boethius, in true Platonic dedication, says[11] that Prophastus added a string to make the enneachord: 1 - hyperhypate, 2 - hypate, 3 - parhypate, 4 - lichanos, 5 - mese, 6 - paramese, 7 - trite, 8 - paranete, 9 - nete; and adds a graphic (Fig. 4). Then, Kircher (1602-1680) eternizes the enneatonic concept of his *Enneachord of Nature* (See appendix) in the hermetic principle of analogies transposed as an instrument on which each of the nine strings sounds through all the layers of existence[12].

2400		2700		3000		3200		3600		4050		4320		4800		5400
	tone		tone		semitone		tone		tone		semitone		tone		tone	
	9:8		10:9		16:15		9:8		9:8		16:15		10:9		9:8	
a'		g'		f'		e'		d'		c'		b		a		g
Clio		Euterpe		Thaleia		Melpomene		Terpsichore		Erato		Polyhymnia		Urania		Calliope

Figure 3. Plato's Muses as factors of 60^4 (3600^2).

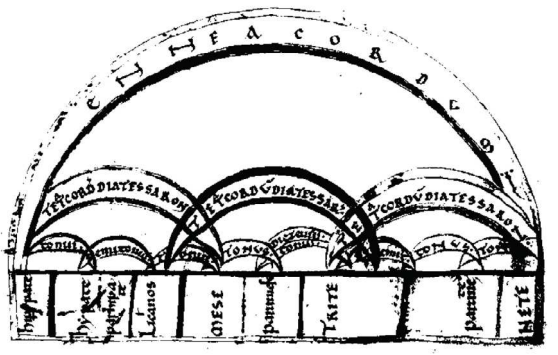


Figure 4. After Boethius, *De Institutione, liber I.*

10 Comford, F.M., *Plato's cosmology: The Timaeus of Plato*, Hackett, (London, 1997). Comford omits the description of Socrates' 'Sovereign Number'. Waterfield, R., *Plato: Republic* (translation, introduction, notes), Oxford University Press, 1993 (World's Classics, 1994; Book of the Month Club, February 1994), notes 'scholars nowadays largely ignore the passage'.

11 Boethius, Anicus Manlius Severinus, *De Institutione Musica, liber I*, sourced from the *Patrologia cursus completus, series latina*, ed. J.P. Migne, 221 vols. (Paris: Garnier 1844-1904), 63:1185. '*Prophrastus autem periotes ad graviorem partem unam addidit chordam, ut faceret totum enneachordum.*'

12 Heninger, S. K., *The Cosmographical Glass: Renaissance Diagrams of the Universe*, (1977): For example, under God in the *mundus archetypus*, we have nine orders of angels; under *coelum empireum*, we have the sphere of fixed stars and the seven planetary spheres (each indicated by a symbol and by the note it plays in the music of the spheres), with earth making up the ninth item in the enneachord and 'playing the lowest note among the elements. (*terra cum elementis proslambanomenos*). Godwin, J., Music, *mysticism and magic: a sourcebook*, (1987), p. 160: Nature thus arranges the various enneachords in the world so that all are in tune with the celestial enneachord; and when one is set going, all the rest will resonate. Fletcher, J.E., *Athanasius Kircher und seine Beziehungen zum gelerhten Europa seiner Zeit,* (1988), p.18: As the notes attributed to them go together, so the things themselves make harmonious or inharmonious 'chords', and as one sounds a certain note in one enneachord, all the other entities tuned to that note or its octave vibrate sympathetically. Boults, E.A., *Landscape of Chance*, (1994), p.14.

The most recent evidence of enneatonism comes from the Lebanese Archimandrite Antoine Hebby in his *Petite Méthode de Musique Ecclésiastique Byzantine*, (1987) (Fig. 5) where he writes that Byzantine music has two scales, the first, enneatonic and made up of two conjoined diatonic pentachords, and the second, octatonic, composed of two disjoined diatonic tetrachords[13].

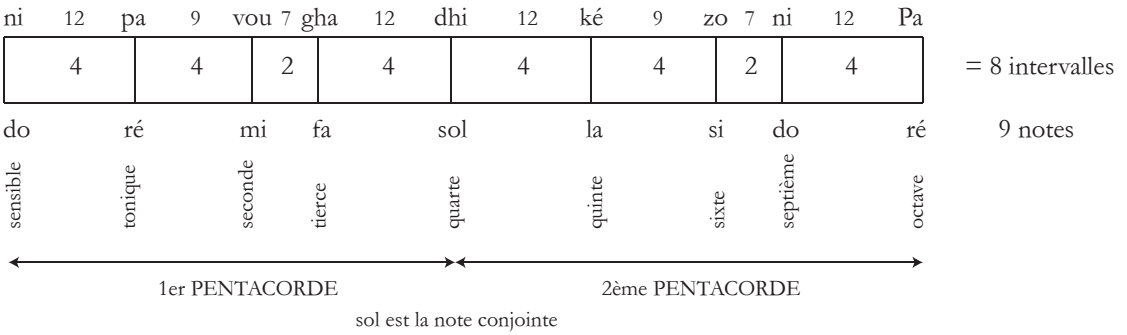


Figure 5. After Hebby, *Petite Méthode de Musique Ecclésiastique Byzantine*.

There has been a continuation of enneatonism probably from the early third millennium; to Plato (428-423 BC); to Boethius (477-524 AD) and finally with Byzantine musicology. This shows that during the historical Near-Eastern and Western periods, enneatonism has had a longer life than heptatonism.

Quantification

About pitch quantification of an enneatonic system, as it is hypothesized in figure 2b, we note that two intervals: the Just fifth and the Just fourth (which is an inverted just fifth[14]), are all that is needed for its construction. A Just, or perfect fifth, is a musical interval corresponding to a pair of pitches with a frequency ratio of 3:2 = 702 cents between them[15]. Its reciprocal is the ratio of string length 2:3, since ratios of frequencies are inversely proportionate to ratios of string lengths.

In Western musicology, the fifth is the interval from the first to the last of five consecutive pitches in a diatonic set[16]. The Just fifth is the container of seven semitones. A bare, open or empty fifth is a perfect fifth without content. It is present in the harmonic series as the interval between the second and the third harmonics, hence its ratio 2:3 (Fig. 6).

The Just fifth is the most consonant of all intervals. However, some treatises claim that the unison and the octave are more consonant because of their ratios 1:1 and 2:1, respectively, compared to the fifth which is 3:2. However, neither is the unison an interval as it is made up of one pitch only, nor is the octave since it is the replication of the unison at a higher register and is therefore not an interval *per se*[17]. 'c' is no

13 The illustration is lifted from Hebby's book printed by IMP. St. Paul, Jounieh, Lebanon, 1987, p. 24.

14 Let us remember that the harmonic series has no partials of the fourth from the fundamental, as overtone. However, it is present between the third and fourth overtone partials and also exists as an undertone.

15 The cent is a logarithmic unit of measure for the quantification of musical intervals. Twelve-tone equal temperament divides the octave into 12 semitones of 100 cents each. Cents are used to measure intervals, or to compare the sizes of comparable intervals in different tuning systems.

16 Don Michael Randel (2003), *Interval*, Harvard Dictionary of Music, fourth edition (Cambridge, MA: Harvard University Press): p. 413.

17 Unison or perfect unison (also called a prime, or perfect prime) may refer to the (pseudo-)interval formed by a tone and its duplication. Although two tones in unison have the same pitch, some theoreticians consider them as intervals only insofar as they come from separate sources, when played on instruments of a different type. Zarlino write: 'Equality is never found in consonances or intervals, and the unison is to the musician what the point is to the geometer. A point is the beginning of a line,

more the octave of 'C' than Sunday the eighth is the octave of Sunday the first. A week does not include two Sundays. The term 'octave' stems from Christian liturgy where it defines the eighth day after a feast.

Below is the illustration of the harmonic series:

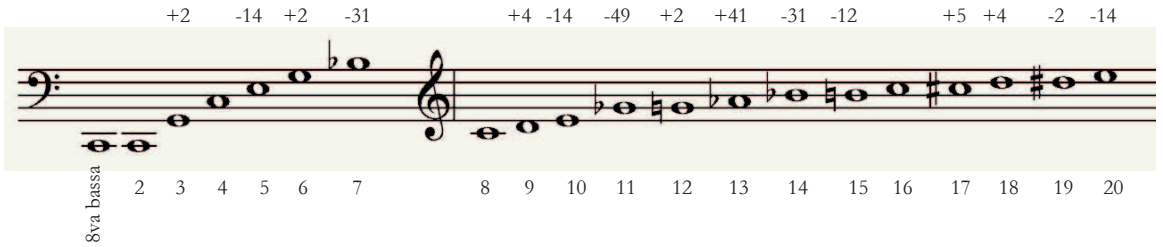


Figure 6. The numbers above the harmonic pitches indicate the quantity by which they vary from the equal temperament, rounded to the nearest cent.

From the information given above for the construction of the set described in figure 2b, it is possible to produce the following quantification:

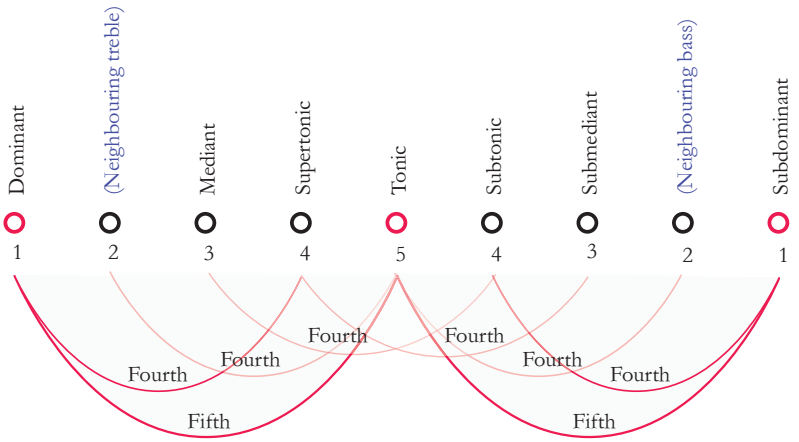


Figure 7. Construction of a system by symmetrical alternation of fifths and fourths.

1) Tonic to Dominant	= 3:2	= 702 cents
2) Tonic to Subdominant	= 3:2	= 702 cents
3) Tonic to Neighbouring treble	= 4:3	= 498 cents
4) Tonic to Neighbouring bass	= 4:3	= 498 cents
5) Dominant to Supertonic	= 4:3	= 498 cents
6) Subdominant to Subtonic	= 4:3	= 498 cents
7) Mediant to Subtonic	= 4:3	= 498 cents
8) Submediant to Supertonic	= 4:3	= 498 cents

although, it is not itself a line. But a line is not composed of points, since a point has no length, width, or depth that can be extended, or joined to another point. So a unison is only the beginning of consonance or interval; it is neither consonance nor interval, for like the point it is incapable of extension.', Rushton, Julian. 'Unison (prime)'. *Grove Music Online*. Oxford Music Online.

This method results in a symmetrical arrangement as follows:

Figure 8. Construction of a system by symmetrical alternation of fifths and fourths with values in cents and in ratios.

In this arrangement tones would be Just, 9:8 = 204 cents and the semitones would be what Greek musicology calls the Pythagorean leimma, 256:243 = 90 cents, or a Just fifth minus three just tones = 702 - (204 x 3) = 90 cents.

This produces two symmetrical fifths, from 1 to 5 = 0 - 204 - 408 - 498 - 702, and from 5 to 1 = 702 - 906 - 996 - 1200 - 1404

It is therefore a ditonic arrangement[18] ascribed to Pythagoras but which in fact would have been conceptualised two millennia and a half before he was born.

For the sake of demonstration, we could say that the pitches in this system are either a-g-f-e-d-c-b-a-g, or g-a-b-c-d-e-f-g-a[19], since there is no indication to suggest, in this text, that the system was ascending or descending[20].

I have used this demonstration to show how it is possible to construct a quantificational hypothesis built on the ubiquitousness[21] of Just fifths and their inversion as Just fourths[22], but as we shall see below, the Sumerian-Babylonian terminology will direct us towards a better understanding of the structure of the enneatonic fundamental or generative pitch set.

It is now appropriate to compare the system in figure 8 and the contents of U.3011. The essential distinction between them is that the first fifth in the Akkadian column of U.3011 has adjectives which suggest that lines 2, 3 and 4 are asymmetric to their counterpart at lines 6, 7 and 8. This is certainly not without meaning and therefore I assume that the Akkadian column of U.3011 was an asymmetric enneatonic construction, or that such it was, at some point, as a development from the older original Sumerian symmetrical construction as described in figure 8.

Then I remembered that some years ago, I read a volume written by the German-American Assyriologist and archaeologist Hermann Volrath Hilprecht (1859-1925) entitled *The Babylonian Expedition of the University of Pennsylvania, Series A: Cuneiform Texts*, where I found a list of numbers reconstructed from four cuneiform texts excavated at the Temple Library of Nippur, and dated

18 There are two meanings for the term 'ditonic'. The most common one describes scales made up of two pitches only such as in Russia with the Cheremis; in Peru with the Shipibo; in Vietnam in some folk poetry; in India where the term Dvisvara means 'two tone'; in Nigeria; with some Maori tribes and in North America with several ditonic scales of Modoc and Klamath tribes of the North American West Coast, in the Great Plains in the rituals of the 1800s Ghost Dance religion. The scale was also used in the music of the Shawnee (https://en.wikipedia.org/wiki/Ditonic scale). The meaning of 'ditonic' in this work describes a heptachord composed of a series of two Just tones (9:8) followed by a semitone (256:243). I have adapted the term to the Sumerian pentachord composed of 9:8; 9:8; 256:243; 9:8.

19 However, this naming of pitches does not infer in anyway that they are tuned in any particular manner. At present, they are unquantified pitches.

20 Some would suggest that the 'rear' would be the bass and that therefore the opposite would be the treble. However, there is no sufficient evidence to support this hypothesis in this text.

21 We cannot assume what was understood as consonance or dissonance in the Ancient Near-East. A fifth is Just when no interferential beats are heard any longer in the process of tuning one string against the other. However, while beats are easily perceived in the tuning of modern instruments, their perception depends on the quality of instruments. Furthermore, we have no evidence that Babylonian theoreticians used beats for tuning purposes.

22 Lots, I.S., and Stone, L., *Perception of musical consonance and dissonance: an outcome of neural synchronization.* Bergelson, E., and Idsardi, W.J., *A neurophysiological study into the foundations of tonal harmony.* Bidelman, G.M., and Krishnan, A., *Neural Correlates of Consonance, Dissonance, and the Hierarchy of Musical Pitch in the Human Brainstem.*

from around 2200 years BC. This list intrigued me because it ended with 80 and 81[23]. These numbers have three important features. Firstly, every table in the tablets starts with the highest number, 81. It is therefore a descending series (if we take these numbers as pitch quantifications). Secondly, the numbers are not consecutive. They are separated by comparatively large intervals, and thirdly, besides 3 and 5, no indivisible number or its multiple is multiplied. What Hilprecht failed to notice, however, is that these numbers are regular. They evenly divide powers of 60. In music theory they occur in the ratios of tones in five-limit Just intonation[24]. The just intonation of the diatonic scale is made up of regular numbers. Therefore with an instrument with this series, all pitches are regular-number harmonics of a single fundamental frequency.

Would Babylonian scholars have used the quantification of string lengths rather than ratios for the conceptualisation of their theory is a hypothetical proposition which will be proven later in this chapter.

There is no evidence that Babylonians used ratios for the purpose of tonal quantification although they were fluent with them and certainly understood that ratios of string lengths are inversely proportional to ratios of frequency[25].

My hypothesis is that Babylonian musicologists used regular numbers. Some may claim that it is the consequence of synchronicity. However, I am of the opinion that these numbers were used intentionally and were not the outcome of simple coincidence. Furthermore, these numbers could be varied in order to generate what some would call modality. It would have been far easier to tune the strings of a lyre to the reference given by a monochord rather than to express pitches as the Greeks might have done, with complex ratios only understood by the musicologist elite.

Back to our text U.3011, at line 1, the Sumerian **sa-di** translates as 'string **DI**' but the meaning of **DI** is unknown. However, line 5 has '**sa-di-***5'. The asterisk indicates that while number '5' was expected, the tablet has '4'. It is possible that this was a scribal error or that there was an erasure. Nevertheless, I will read '5' until proven that it was otherwise. The problem is why **sa-di** appears in line 1 and in line 5. I think that there is a tonal relationship between the pitch of string 1 (prime), string 5, and the rear-string. I take it that the Sumerian term **sa-di** and its Akkadian equation *qudmû* should be translated as 'prime' rather than 'fore' because **sa-di**/*qudmû* would describe both the tonal centre of the structure but also the fundamental pitch, i.e. the pitch from which the sequence started. Furthermore, the term 'prime' does not necessarily mean only 'first' or 'fore' but also, and most importantly, indicates predominance, which is the case here.

We shall now compare the system in figure 8 with the Nippur regular numbers:

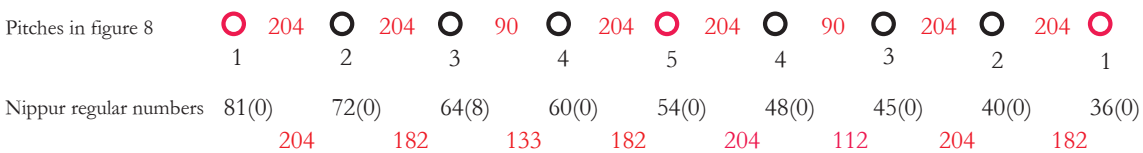


Figure 9. Comparison of the quantification of figure 8 and the Nippur regular numbers.

23 These two numbers are significant to musicologists because their ratio 81:80 was used to correct the Pythagorean major third (81:64) to a Just major third (5:4).

24 Five-limit intonation is any system for tuning a musical instrument which obtains the frequency of each note by multiplying the frequency of a given reference note by products of integer powers of 2, 3, or 5 (prime numbers limited to 5 or lower), such as $2^{-3} \cdot 3^{1} \cdot 5^{1} = 15/8$.

25 Although they would not have known the concept of frequency as we perceive it today. They would certainly have felt, by the sense of touch or the sense of vision, that the frequency of vibration was relative to pitch.

We note significant differences between the figures:

1) 810:720 = 9:8 = 203.910002* cents. Just tone of Just Intonation (JI)
2) 720:648 = 10:9 = 182.403712 cents. Minor tone (JI)
3) 648:600 = 27:25 = 133.237575 cents. Great Leimma
4) 600:540 = 10:9 = 182.403712 cents. Minor tone (JI)
5) 540:480 = 9:8 = 203.910002 cents. Just tone (JI)
6) 480:450 = 16:15 = 111.731285 cents. Just semitone (JI)
7) 450:400 = 9:8 = 203.910002 cents. Just tone (JI)
8) 400:360 = 10:9 = 182.403712 cents. Minor tone (JI)

*I have calculated cents accurately in order to best match ratios.

Nippur regular numbers give figures which are well-known to the tonal palette with just tuning ($2^p3^q5^r$) while Ancient Greek used the so-called Pythagorean tuning (2^p3^q).

Now how do these Nippur figures agree with the terminology in U.3011:

String-pitch 1 at 810[26] is the highest number in the Nippur tables and indicates the tonal fundamental of a descending system based on string lengths. It is therefore a 'prime' pitch.

String-pitch 2 at 720 is a Just tone away (9:8) from pitch 1. It is the Sumerian **sa-ús**, Akkadian *qud-mu-um*, the 'neighbouring' string. Perhaps a manner of naming this string-pitch which is the neighbour of both the prime string-pitch and the third thin-pitch string.

String-pitch 3 at 648 explains its need for 3 digits regular numbers because it is the consequence of the construction of a 'dissonance[27]' in the system between string-pitches three, in both parts.

String-pitch 4 is Ea-the creator, probably because it restores the chaos brought about with pitch 648 into consonance with its pitch of 600. As we shall see later with the analysis of text U.7/80, the metabolic principle of the Babylonian system, precisely rests on the correction of the dissonance into consonance. This is exactly what the fourth string-pitch does.

String-pitch 2 is the neighbour of string-pitch 3 because the interval separating them is smaller than the previous one: 182 instead of 204. The third string is 'thin' because it was introduced within the pentatonic system to create diatonism. Without fourths crossing over the axis, the system based on the alternation of fifths and fourth was pentatonic:

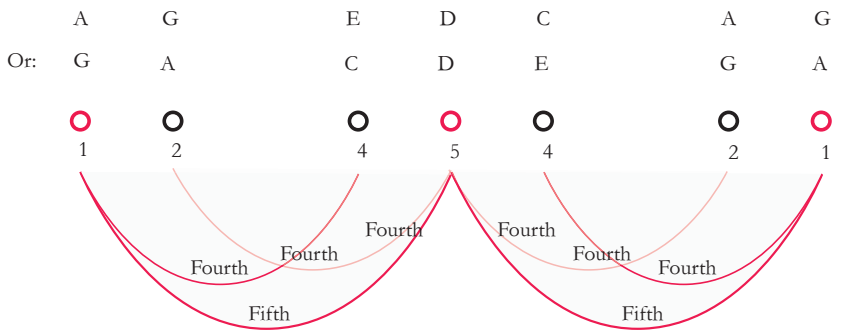


Figure 10. Construction of pre-diatonic pentatonism.

26 I have multiplied regular numbers by 10 in order to avoid the figure of 64.8.

27 648:450 = 36:25 = 631.282574 cents. Not a tritone but an acute diminished fifth. The tritone measures 612 cents. This dissonance was named '*la zaku*' in Akkadian which means 'unclear', from the adjective '*zakû*' and the negative 'la'.

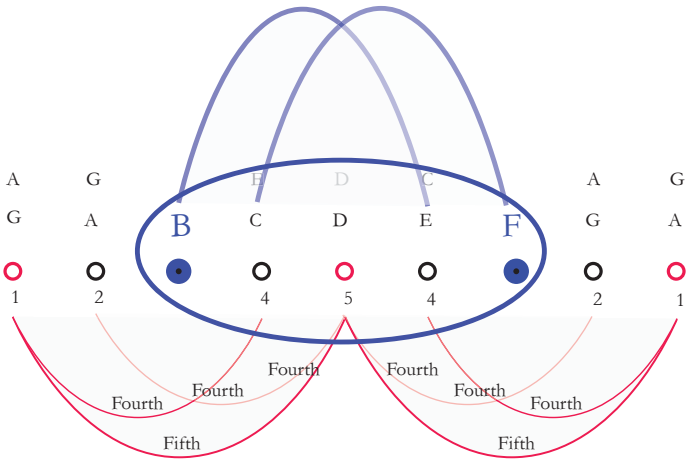


Figure 11. Construction of diatonism from pentatonism.

Note that generative diatonism is constructed from two conjoined pentachords where fourths cross-over the boundary of the axis of symmetry with one tetrachord, string-pitch thin 3 and string-pitch four of the rear, and from string-pitch 3 of the rear to string-pitch 4 Ea-creator. The consequence is a diminished fifth B-F, or F-B measuring 631 cents[28] inscribed in the blue ellipse.

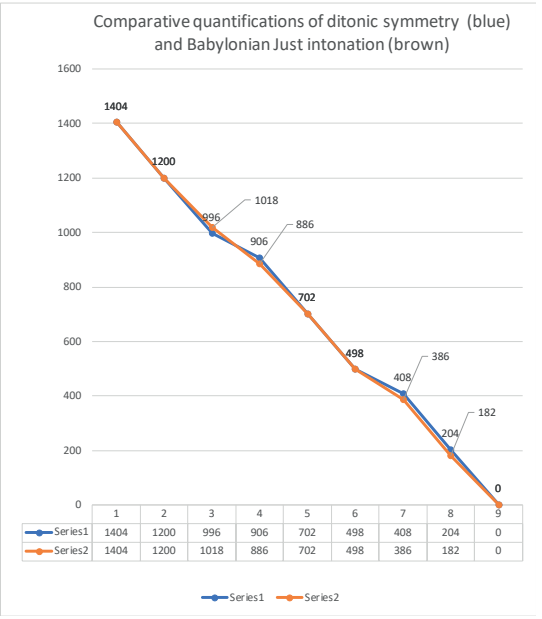


Figure 12. Comparative graph of the ditonic symmetric construction by Just fifths and fourths (brown) and the construction by regular numbers of the Nippur tables (blue).

28 Actually, 632 cents equals 36/25, the acute diminished fifth.

On this illustration, the difference looks minimal, as it would sound, playing each scale, one after the other. However, should they be played together, the differences would be distinctly heard, even to the untrained ear.

This extraordinary text has revealed important facts about the fundamentals of Sumerian and Babylonian music:

1) The generative system was composed of nine string-pitches which would have been originally arranged in a symmetric pattern implied in the palindromic numbering 1-2-3-4-5-4-3-2-1 which was the only way to describe it. This would have preceded the later Akkadian qualifications.

2) The Sumerian palindromic arrangement and its Akkadian variations have allowed for a hypothetical quantification which matches the regular numbers from the Temple Library of Nippur. These numbers being the exact replication of the quantification of natural harmonics, it is therefore my hypothesis that the series from 81 to 36 constituted their tonal fundamental and generative pitch set.

3) The contents of the tablet firmly establish that the enneatonic, or nine pitch system, was in usage, probably from the early third millennium BC and was still practiced in the last days of the first millennium BC, as other text will confirm. Therefore we may safely postulate that Sumerian-Babylonian music theory developed parallelly to the development of the language.

4) This tablet being the thirty second of a well-known lexical series proves that music theory was part of the Babylonian scholarship and was considered, along with principal sciences, with the greatest academic respect. Music theory would have been part of the syllabus at various levels of education.

My quantifications for each of the nine pitches of the enneachord has been made from the premise that they used a Just intonation scaling as it is given in regular numbers on the cuneiform tablets from the Temple Library of Nippur. However, it remains that, as we shall see when comparing my hypothesis with hypotheses derived from other texts, that there is coherence between them and consequently my calculations must be very close to what Babylonian musicologists intended. However, this remains a tonal system, or a system constructed by learned Babylonian scholars. Popular musicians, who played music in the streets of ancient cities or at village festivals might have had different systems the nature of which we shall never recover because it was not quantifiable by techniques known at that time, or that learned scholars would not have notated their music that they probably considered as an inferior cacophonic, even libidinous form not even worth reporting. Theoreticians write theories for the entertainment of theoreticians for which musicians have no time.

Appendix

In *Musurgia Universalis*, Book seven, part three, chapter two, Kircher writes:

> ...I say that the first string, when struck, produces 48 vibrations, and that the string *re* will make 54 vibrations, so that the speed of vibration of the two strings expressing the major tone *ut-re* would be as 48 to 54. The strings *re-mi* would be in velocity as 54 to 60...

We note that Kircher's '*re*' has number 54 which is precisely the tonal centre in U.3011, as I have hypothesized. The other quantifications he gives are in relation to the octave and therefore, the Babylonian 81 become Kircher's 80; Babylonian 64.8 is Kircher's 64. Other quantifications agree with the Babylonian paradigm.

CBS 10996

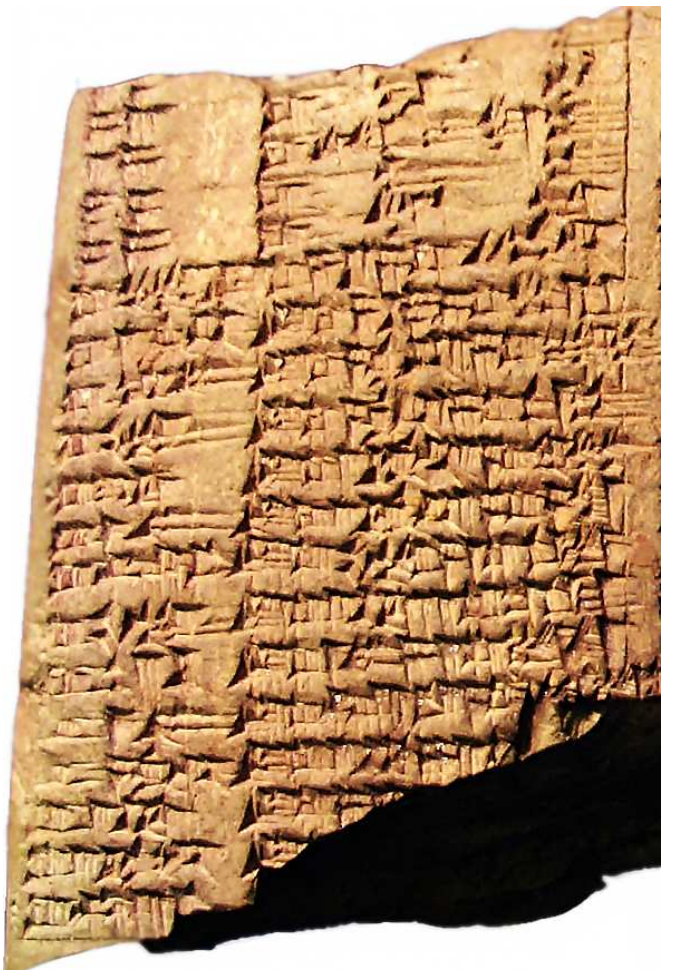


Figure 1. Detail of CBS 10996 showing the part of the tablet inscribed with music intervals. Courtesy of the University Museum, Philadelphia, Pennsylvania.

Preliminary

As a preliminary to the analysis of this particularly complex and highly significant text, I would like to warn against a principle by which descriptive musicology mostly turns prescriptive depending on our ability to isolate ourselves from our own 'subconscious knowledge' of which we may think that it is universal. Therefore, the most difficult part in understanding theories of the past is to forget theories of the present.

Liminary

This cuneiform text was acquired from a dealer in the late nineteenth century by the Museum of the University of Philadelphia, Pennsylvania. It probably came from Nippur and dates from about 600 BC. It is probably not the copy of an older text, firstly because the information with which it is inscribed would have been unprecedented at the time it was written and secondly, that it agrees with the instructions on another text, CBS 1766, of the same period, also hosted at the University Museum.

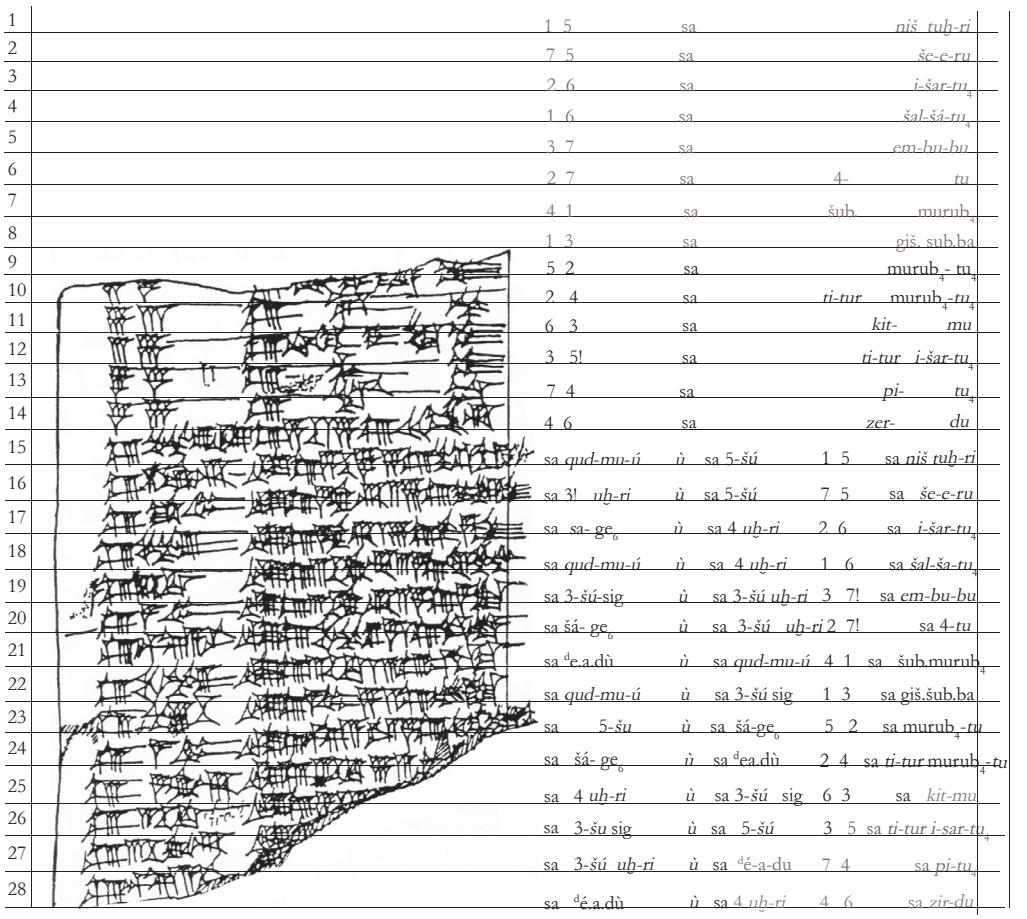


Figure 2. Hand copy after F. al-Rawi. Transliteration by J. Friberg.

Introduction

The tablet has it top and bottom parts broken away. However, the part which remains almost intact reveals a pattern from which a reconstruction of the whole text could be achieved by means of extrapolation.

The above reconstruction of the text is accurate, as all agree. We note that it consists of two sections. The first from line 1 to line 14, and the second from line 15 to line 28. Each section has fourteen lines.

The first section consists of musical intervals written as numbers followed by the name of an interval,

for instance, line 1: '1 5 **sa** *niš tuḫri* '. We take it that '1 5' is the location of an interval on a pitch set. '**sa**', which usually means 'string', appears also to means 'interval' in this text. The second section adds names to numbers in the text. For instance, line 15 has: '**sa** *qudmû* ' and '**sa** five 1 5 **sa** *niš tuḫri* '.

One might ask why the term '**sa**', in the present text, means both a 'string', 'the location of an interval' and 'the name of an interval'. In the first entry for the term, the *Chicago Assyrian Dictionary* (*CAD* henceforth) defines '**sa**' as: 'string of a musical instrument', and in a second entry: 'a stringed musical instrument'. '**sa**-**a** **SA** = *ši-ir-a-nu*, *gi-du*, *pi-it-nu* '. In the *CAD*, '*šer'ānu* (*šir'ānu*)' means sinew, as material for manufacturing objects. Sinew can be used for making short strings[1].

1) For '*širanu* ', the entry 'c' in the *CAD* has: 'for musical instruments: *išarī lu* **SA**-*an* (var. šér-an) *sammê* ' which translates as: 'Let my penis be a (taut) lyre string'. Therefore, it is clear that '**SA** = *ši-ir-a-nu*' means 'string - of a musical instrument'.

2) For '*gīdu* ', the translation is also 'sinew-of the animal body which are of economic value for making cords or the like'. Sinew might have been used for making strings, but the term does not have any other useful definitions.

3) For '*pitnu* ', there are two meanings: 1, 'string of a musical instrument'. 2, 'a stringed musical instrument'.

However, the *CAD*, sends us back to *nabnītu* xxxii (U.3011) for the term '**sa**' meaning 'string'. For '*pitnu* ' as a musical instrument, the *CAD* has '[**LÚ**].**NAR** *ina pi-it-ni* [. . .]' meaning 'the musician on the *pitnu* [praises you]', and '*pit-nu u rigma šumsukāku*', meaning 'I am bereft of(?) the *pitnu* and (its) sound'.

There are no distinctions between '**sa**' as 'string' and '**sa**' as 'name of interval'. Babylonian scholarship may not have addressed this issue. However, is there a need for such a distinction? When '**sa**' is followed by two numbers such as '1 5', it obviously means the location and the span of an interval, and when it is followed by a name, obviously it means 'interval'. '**sa**', therefore acts as a form of determinative[2] for some musical terms.

Transliteration of the reconstructed text (first part)

1	[1 5	**sa**	*niš tuḫri*]*
2	[7 5	**sa**	*še-e-ru*]
3	[2 6	**sa**	*i-šar-tu*$_4$]
4	[1 6	**sa**	*šal-šá-tu*$_4$]
5	[3 7	**sa**	*em-bu-bu*]
6	[2 7	**sa**	4-*tu*]
7	[4 1	**sa**	**šub.murub**$_4$]
8	[1 3	**sa**	**giš.sub.ba**]
9	[5 2	**sa**	**murub**$_4$-*tu*$_4$]
10	2 4	[**sa**	*ti-tur*] **murub**$_4$-*tu*$_4$
11	6 3	**sa**	*kit-mu*
12	3 5!	**sa**	*ti-tur i-šar-tu*$_4$
13	7 4	**sa**	*pi-tu*$_4$
14	4 6	**sa**	*zer-du*

* Texts or parts of text between square brackets indicate that they have been reconstructed by extrapolation, or by another method.

1 Animals sinew can be separated in strands. However they are never long enough to make long strings for monumental lyres or harps.

2 A determinative is an pre or post-positioned ideogram used to mark semantic categories of words in logographic scripts.

Transliteration of the reconstructed text (second part)

15	**sa** *qud-mu-ú*	*ù*	**sa** 5-*šú*	1 5	**sa** *niš tuḫ-ri*
16	**sa** 3! *uḫ-ri*	*ù*	**sa** 5-*šú*	7 5	**sa** *še-e-ru*
17	**sa sa-ge**$_6$	*ù*	**sa** 4 *uḫ-ri*	2 6	**sa** *i-šar-tu*$_4$
18	**sa** *qud-mu-ú*	*ù*	**sa** 4 *uḫ-ri*	1 6	**sa** *šal-ša-tu*$_4$
19	**sa** 3-*šú*-sig	*ù*	**sa** 3-*šú uḫ-ri*	3 7!	**sa** *em-bu-bu*
20	**sa šá- ge**$_6$	*ù*	**sa** 3-*šú uḫ-ri*	2 7!	**sa** 4-*tu*
21	**sa** ^{d}**e.a.dù**	*ù*	**sa** *qud-mu-ú*	4 1	**sa šub.murub**$_4$
22	**sa** *qud-mu-ú*	*ù*	**sa** 3-šú **sig**	1 3	**sa giš.šub.ba**
23	**sa** 5-*šu*	*ù*	**sa šá-ge**$_6$	5 2	**sa murub**$_4$**-tu**
24	**sa šá- ge**$_6$	*ù*	**sa** ^{d}**ea.dù**	2 4	**sa** *ti-tur* **murub**$_4$**-tu**
25	**sa** 4 *uḫ-ri*	*ù*	**sa** 3-*šú* **sig**	6 3	**sa** *kit-mu*
26	**sa** 3-*šu* **sig**	*ù*	**sa** 5-*šú*	[3 5	**sa** *ti-tur i-sar-tu*$_4$]
27	**sa** 3-*šú uḫ-ri*	*ù*	**sa** [^{d}**é-a-du**	7 4	**sa** *pi-tu*$_4$]
28	**sa** ^{d}**é.a.dù**	*ù*	[**sa** 4 *uḫ-ri*	4 6	**sa** *zir-du*]

The names of string-pitches are reasonably well understood from our analysis of text U.3011, but the meaning of the intervals in CBS 10996 remains obscure. Most probably, these terms carried a significance which has eroded and eventually vanished with time, making their interpretation difficult. However, '*qablītum*' (written '**SA MURUB**$_4$-*tu*') is unequivocal: it means 'middle-part', or 'inner-part'. The term '*tuḫri*' in lines 1 and 15 is found in the *CAD* under '*šaḫūru* B (*šuḫāru*, *šuḫru*, *suḫru*, *zuḫru tuḫru* and *šiḫru*)', and is defined as 'a part of the foot'. '*šēru*', entry B, has 'song'. The word is found at Mari, Ras Shamra, in Standard and Neo-Babylonian. '*išartu*' suggests 'straight, normal'. Adjective '*šalšatu*', under '*šalšu*', along with '*šaššu* (feminine *šalištu*), *šaluštu*, *šalultu*, *šalussu*, *šaššatu*', means 'third'. The term '*šalšu*' is known from U.3011, line 3, Akkadian column. The next term, '*embūbu*', also '*enbūbu*, *ebūbu*' is said to mean 'flute' in the *CAD* which is an unsatisfactory translation. The generic term 'pipe(s)' would be more appropriate as it defines all 'pipe-like'-instruments, of which flutes are part. Text KAR 158, reverse i 47 (a catalogue of songs) has: Sumerian '24 **GABA.MEŠ**', Akkadian '*ša eb-bu-be*', translating as '24 breast-songs to the (type of pipe[3])'; '*ši-iṭ-ru ša eb-bu-be* **URI**^{ki}' meaning '13 . . . . to the flute, Akkadian'. '4-*tu* = *rebūtu*'. It is known from U.3011 as '*ribi uḫrim*', line 6. Some suggest that Sumerian '**šub.murub** = *nīd qabli*', means 'fall of the middle'(?). Sumerian '**giš.šub.ba** = Akkadian *isqu*' is translated it as 'lot/portion'(?). Sumerian '**murub**$_4$**-tu** = *qablītu*', means 'part of the middle', unequivocally. '*titur* **murub**$_4$**-tu** = *titur qablītu*', 'bridge of the middle'(?) '*kitmu*' would mean 'closing'. '*titur išartu*' would be the 'bridge of the middle'. '*pitu*' means 'opening'. This term is the second which makes sense in this list as the word also names a pitch set, or scale, and this scale is, as demonstrated with U.3011, the generative scale of the system, or the 'opening'-scale a-g-f-e-d-c-b-a-g. '*zirdu*', may be translated as 'lament'. Only translations of '*qablītu*' and perhaps '*pitu*' seem coherent to musicology.

The first part of CBS 10996 could, at a first glance, be considered as an abridged version of the second part. Although both mean the same thing, their formulation is more complete in the second part than it is in the first. This is certainly not without meaning. The question is what could be more important to say, in the second part, that was not said, in numerals, in the first part, to the extent that it would require a textual formulation? My contention is that both parts, although sharing the same concept expressed differences between them, within the same system.

3 My translation.

General considerations

Text CBS 10996 is neither prescriptive nor is it instructive. It is descriptive. Therefore, numbers and names of string-pitches only locate and characterize intervals, respectively, but do not give any instructions as to intervallic pitch precedence in space and, or time. The structural morphology and the purpose of these intervals cannot be extrapolated from this text alone, but can be extracted from comprehensive comparative studies of theory and practice in contemporary proximal textual contexts.

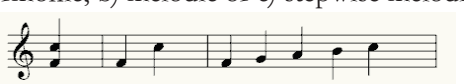
From the information gathered so far, and as shall be proven in the course of the present chapter, it may be postulated that:

1. There is absolutely no evidence that these intervals were harmonic.
2. The intervals listed in this text are stepwise melodic, as shown with our analysis of the right column of U.7/80, in the next chapter.
3. These intervals spread onto a heptatonic span but do not express, indubitably, a heptatonic system.
4. The particular arrangement of these intervals shows that initially they would have lain onto a tridecatonic span, or a span of thirteen pitches, as explained in my interpretation of text U.3011, and comprehensively described in this chapter.
5. Texts CBS 10996 and U.3011 are systemically related.
6. In my reconstruction of the text into its original tridecatonic status, composers relied on a melodic (pre-Maqamian) system of seven descending stepwise melodic fifths and of seven ascending stepwise melodic thirds arranged in a strict sequential order providing with a comprehensive palette of pitch series.

Follows a series of standards:

I - Types of intervals

Intervals can be either a) harmonic, b) melodic or c) stepwise melodic, as shown below.



a) b) c)

Dyads, as they are sometimes called, are intervals where both pitches are sounded simultaneously. Prior to the Renaissance, chords making up a forerunner of harmony consisted of two pitches only. It is therefore legitimate to say that dyads are harmonic intervals.

Babylonian musicology certainly predates the Renaissance. Early forms of harmony in the Occident came from specific monophonic structures responding to meticulously defined rules before they could induce vertical pitch patterns, or harmony. These progressed along with monophonic horizontality, and only in specific acoustical environments where the reverberation level allowed for the natural blending of selected pitches. It is therefore not surprising that the earliest attempts at harmony sprouted from the École de Notre Dame de Paris, in the twelfth-thirteenth centuries in the newly built cathedral. Reverberation, which is one of the causes of early harmony, led to rules, but mud-brick structures, typical of the Ancient Near-East, which have no or very little reverberation levels, would not have been a suitable environment from which early forms of harmony would have sprung. Therefore, the idea that the intervals in CBS 10996 were harmonic is not only unevidenced but it is also as improbable as it is unreasonable.

II - Voice and instruments: monophony, heterophony and polyphony[4]

The voice is the seminal instrument. It is an essential part of our anatomy, our physiology as well as of our psyche. It has a plurality of functions: it is a warning system, a system of communication, a system which allows to generate an inexhaustible range of emotions; it hosts our linguistic abilities and is the most perfect of all musical instruments as it allows for the singing of text riding on its pitches, a feature unique to humankind. No other instrument has these abilities. However, the only limitation of the voice is that it is unable to produce two pitches simultaneously[5]. This is a reason among many why the intervals in CBS 10996 could not have been harmonic. Instruments are extensions of the voice which they emulate and therefore, in Antiquity, remained monophonic until much later developments in the late first millennium AD.

The hypothesis of an early form of Babylonian embryonic polyphony is not an impossibility, but these terms must not be taken as musicology defines them today. We are at present hypothesizing on the earliest forms of these concepts and can only estimate what they might have been, based on textual, iconographic and other contextual evidence. I think that a melody which was known by a number of singers and musicians could have been sung or played by them as a group, occasionally, when they met for a celebration, a ritual or whatever. However, each singer, two or three of them, would have sung their own version of the same melody with differences which they developed because they were mainly isolated from one another and did not have access to a version of reference such as a score or, as we have today, technical recordings of the melody. When they met as a group, and sang together, although it was the same melody, each with its own idiosyncrasies, the outcome was what I would call proto-heterophony.

Practice at the temple would have been different because each city had its own deity and a temple for their worship. There were temple personnel of singers and musicians who would have sung the same melodies without any 'accidental' heterophony, because they might have practiced together. This leads to an interesting hypothesis about the development of tonal and modal concepts, the tonal being illustrated by the consistency of temple singing dictated by precise tonal rules, and the modal, by the isolated developments of melody. However, none of these early forms would have responded to the dictate of the fourteen hypothetical harmonic intervals as they lay in CBS 10996, as these would have been anachronic among many other reasons already mentioned.

III - Iconographic evidence

The iconography of the Ancient World has represented lyre players, in Ancient Greece, particularly, strumming selected strings with a plectrum in their right hand while muting other strings with their left[6]. However, this does not constitute evidence that they were strumming specific strings with the conscious intent of generating consonantal harmony as we understand it today, or strumming the intervals as they are placed in CBS 10996.

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4 These terms must not be understood in their current descriptions of musical structures. Here, they must be taken as seminal expressions of seminal phenomena from which current definitions have emerged, eventually.

5 With the exception of what is called 'overtone' singing. However, this technique is another matter all together as the singers can only produce overtones (and undertones) of a fundamental pitch of the song they are singing. There are remarkable examples in Mongolia; Buryatia; Tuva; in the Altai and Khakassia; in the Chukchi Peninsula; in Tibet; Uzbekistan and Kazakhstan; Pakistan, Iran and Afghanistan; Japan; Sardinia; with the Sami people, etc., but none of these wonderful forms would be able to sing the intervals of CBS 10996, should they be harmonic. https://en.wikipedia.org/wiki/Overtone_singing

6 West, M.L., *Ancient Greek Music*, Pls. 1, 4, 5, 11, 13, 14, 15, 16, 18, 19.

Other iconographic scenes show groups of instrumentalists, but this does not unquestionably mean that they were engraved on the seal while they were playing, as we catch them live on our mobile phones. The lapicide might have been asked to etch a cylinder seal to show off the musical belongings of the owner, on his request. The lapicide engraved the seal in his workshop, from memory, probably with precise instructions, or following the instructions of an official. But he would certainly not have travelled with his equipment to carve scenes *in situ*, in 'real time', or 'live'. When back in his workshop, his memory of the scene would certainly not have allowed him to remember precise finger positions on strings proving the praxis of consonantal harmony.

IV - Absolute versus relative pitch

In 'modern' Western practice, the playing of instruments in groups implies a shared standard, or absolute pitch. However, the iconography of the Ancient Near-East shows that there were no standards in the size of instruments. Chordophones, aerophones, percussion and idiophones, were all of different configurations. Therefore a shared common pitch is most unlikely. The strings of instruments sound to their best when they are at about eighty per cent of their breaking point and therefore, with different sizes of instruments, a common pitch would have been an impossibility because it would not have suited the ideal string tension for each instrument. This further supports the practice of a form of proto-heterophony where a common pitch would have been irrelevant.

Therefore, intervals in CBS 10996 would not have been conceived for absolute, but for relative pitch because of these variations. The Mari archives have showed that there were no specialised luthiers. Additionally to instrument making these artisans were cabinet makers and generally worked with wood and hides. During the Sumerian period, a bull-lyre was larger than a calf-lyre: their soundboards were made from bull or calf hides and their strings from bull or calf guts, respectively, initially for totemic reasons, and each would have had its own pitch.

V - The meaning of polarity

I will now introduce the intervallic polarity, a musicological concept which I have formulated to describe the contents of the only known text, CBS 10996, to which it is applicable, as far as I know.

Polarity which defines the orientation of an interval, or which is the first pitch played, can only apply to melodic, and to stepwise melodic intervals where the pitches are consecutive. Polarity is not applicable to harmonic intervals because both of their pitches are played simultaneously. The direction of the polarity is relative to the direction of the pitch set (ascending or descending) where the intervals lay, and is determined by the pitch or string number which is first written, i.e. '1 5', or '5 1'.

It is not clear if Babylonian scholarship associated pitch height with altitude. This view is allegorical as a high pitch does no sit higher than a lower pitch. Babylonian scholars certainly understood that what we define as, 'higher' pitches, were produced by shorter strings and 'lower' pitches by longer ones, but that they associated altitude with string length is doubtful[7]. However, they could have adopted the

7 Ancient Greek music theoreticians used 'sharpness' and 'heaviness'; in Bali and Java pitches are 'small' or 'large'; with the Suyá of the Amazon, they are 'young' and 'old.' The oldest reference we may have for pitch height might come from the Hurrian where the music texts mention *ašḫuwe* and *durie*, for a melodic stepwise interval placed to the treble, and to the bass, respectively. Therefore, *nīš tuḫrim ašḫuwe* would be the *nīš tuḫrim* interval placed at the treble; *nīš tuḫrim*, the *nīš tuḫrim* interval at the middle, and *nīš tuḫrim durie*, the *nīš tuḫrim* interval at the bass. Unfortunately, there is no conclusive meaning for

idea form mythology, as the West did to a certain extent.

In text CBS 10996 the intervals are identified by numbers and names, the names being more or less the philological equation of the numbers. They have a mix of ascending and descending polarity, (1-5; 7-5, etc.) therefore they can only be melodic as there would be no point in this inversion should all of the listed intervals be harmonic. Therefore, polarity has a meaning which cannot be ignored in the present context.

I contend that the intervals in CBS 10996 were stepwise melodic because each interval has a different name. There would have been no reason for this distinction if it were not to indicate that they had content. Numbers would have sufficed as their function was used only to locate intervals within a span while names indicated content. Numbers and names, therefore, have different functions.

It might be that one part expressed stepwise melodicity while the other expressed empty melodicity, but what would have been the reason for it is difficult to tell.

The study of ethnomusicology very often shows that the tuning of intervals was made by means of three consecutive pitches stored in tonal memory, and I believe this would have been the practice in the Ancient Near-East, in the earliest pre-literate periods and then left its imprint in the construction of Sumerian-Babylonian systems.

With melodic intervals, it is a well-known practice to sound the first pitch and then tune the second in its relation, consecutively, for its better perception compared to the first, as any piano tuner would tell. Therefore, the hypothesis that the intervals in CBS 10996 were harmonic for tuning purposes is flawed. Some would argue that the tuning of the violin's fifths requires harmonic, therefore simultaneous intervals, but bowed instruments are unknown in Antiquity.

VI - The meaning of the conjunction 'ù' in CBS 10996

This conjunction means either 'and' or 'or'. Since Akkadian does not make a distinction between them, the second meaning, 'or', has to be rejected on the basis that "string one 'or' string '5'" is meaningless to musicology, in the present context. Therefore, 'ù' needs to be further scrutinized since it is essential to the understanding of the present manuscript. In the first part of the text, lines 1 to 14, there is no conjunction between the interval numerals, i.e., we have '1 5' but not '1 'ù' 5'. On the other hand, in the second part of the text, lines 15 to 28, there is a conjunction between the names of the strings but not between their equivalent numbers written on the same line, i.e., we have **sa** *qud-mu-ú ù* **sa** 5-*šú* 1 5 **sa** *niš tuḫ-ri*, but not **sa** *qud-mu-ú ù* **sa** 5-*šú* 1*ú* 5 **sa** *niš tuḫ-ri.*

In the present text, firstly, is the absence of the conjunction 'ù' between numerals a grammatical practice, or is its presence or its absence significant, in the present case, of either melodicity or harmonicity (and reciprocally) and are there any other instances of its presence to indicate similar distinctions (in other fields)? Secondly, is the conjunction 'ù' between two terms, as it stands, in the present text, or its absence, significant of melodicity or harmonicity, respectively, or inversely, as it would or would not with numerals? Or, to put it simply, does '1 5' equate to '**sa** *qud-mu-ú ù* **sa** 5-*šú*' and mean the same thing?

I believe it is more reasonable to assume firstly that the absence of a conjunction between the numerals and its presence between two locutions indicate - in both cases and on the basis of musicological coherence - melodic intervals, because the probability of having harmonic intervals of Just fifths, Just fourths, Major and minor thirds and Major and minor sixths, as suggested by some of my learned colleagues, at that period of history, is most unlikely for reasons that are too numerous to mention here. Secondly, the inconsistency in intervallic polarity supports the postulation. But most importantly,

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the terms *ašḫuwe* and *durie*. This will be discussed later in this book in the chapter about the Hurrian texts.

thirdly, had the scribe been instructed to suggest harmonicity, he would most certainly have found an unequivocal manner to express it because this would have been an innovation worth a particular philological distinction such as *aḫāmeš*. Conclusively, the postulation of most Assyriologists/ musicologists that these intervals were harmonic, unquestionably, is incomprehensible.

VII - The nature of the intervals in CBS10996

In my tridecatonic reconstruction, the text lists seven descending fifths and seven ascending thirds. They are listed in a series of alternating descending fifths and ascending thirds. The fifths are: *niš tuḫri*; *išartu*; *embūbu*; *nīd qabli*; *qablītu*; *kitmu* and *pītu*, and the thirds are: *šeru*; *šalšatu*; *rebūtu*; *isqu*; *titur qablītu*; *titur išartu*; *serdû*. The names of these intervals do not give any indication as to their location. This is left to the numbers to which they are associated, for example: 1 5 **sa** *niš tuḫ-ri*. However, similarly to the ajnas[8] of the Maqamian system, each of these terms signify different arrangements of pitches contained within each interval. There is therefore a striking similarity between Arabian ajnas[9] and the Babylonian terms for which we have not yet found any satisfactory name, although there seems to be a verb indicating the 'displacement' of an interval, but not the generic name for the term 'interval' itself (see chapter about N.4782). Numbers are locators and terms are containers.

VIII - The function of thirds in CBS10996

Until now there has been the most fanciful interpretations for the purpose of the thirds in CBS 10996. Some have even argued that they served for the refinement of the tuning of fifths, but this is probably because these authors have no idea that it is the number of the beats between both pitches of a third when played simultaneously and their counting, then the increasing or decreasing of the number of beats per second by tensioning or relaxing one of the pitches which are the means by which any tuning can be refined, and specifically when one knows by which quantity each third should beat in order to even up a temperament. The refining of the tuning by thirds is not a matter of pitch but it is a matter of one's ability to count beats per second, or by any other unit of time. This is a complex process. The hypothesis that Babylonian theoreticians knew about this phenomenon for that purpose is simply so absurd that I do not need to justify myself with any further explanations.

The reason for the position and polarity of the intervals of thirds as they are placed between intervals of fifths in my reconstruction of CBS 10996 has never been elucidated by any scholar having written about this text.

A pattern arises from their position: Interval of third *šeru* (7-5) at line 2 (of the first part) plus interval of third *rebūtu* (9-7) at line 6 equals interval of fifth (5-9) *qablītu* at line 9. This can be simplified as (l.2)7-5 + (l.4)9-7 = (l.9)5-9. The series continues with 8-6 + 10-8 = 6-10; 9-7 + 11-9 = 7-11, etc. In this clever arrangement we understand why the thirds are ascending as they have the highest integer on the outside (**7**-5/9-**7**) while the inner integers give the fifth they produce (7-**5**/**9**-7). This will conclusively prove that fifths are constructed from specific conjoined thirds, and that their position in the system has a purpose of order, linearly: (l.2; l.6; l.9) (l.4; l.8; l.11) (l.6; l.10; l. 13) (l.8; l.12; l.15) (l.10; l.14; l.17) (l.12; l.16; l.19) (l.14; l.18; l.21) etc.

This is best illustrated with the following graphic:

8 The ajnas, singular jins, are the building blocks of the maqam system. The ajnas are the basic melodic units in Middle-Eastern music. Each jins is defined by the nature of its intervals, which does not vary when transposed and give it its particular character.

9 This term is most probably borrowed from the Greek γένος [genos], plural [genē], γένη 'type, kind'.

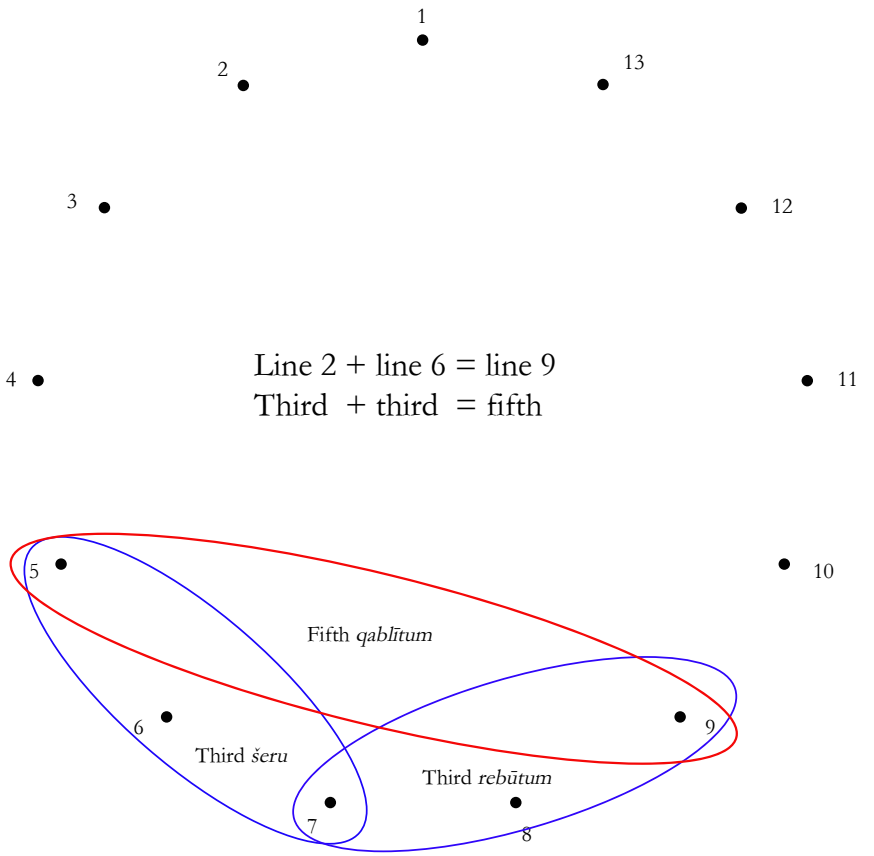


Figure 3. Position of the thirds in lines 2 and six amounting to the fifth in line 9.

The pattern above can be rotated in any direction to show the formation of fifths from thirds throughout the system.

IX - The concept of systems

Although the intervals in the original CBS 10996 text spread onto a heptatonic span, this does not constitute evidence of heptatonism. This needs some explanation. A span does not determine a system anymore than a system determines a span. A melody may spread onto ten contiguous pitches, but this does not mean that it represents a 'decatonic' system, no more than pentatonism is restricted to the ambitus of its five pitches. Therefore one cannot assume that neither an instrument fitted with seven strings nor a series of seven consecutive numbers is necessarily representative of a heptatonic system unless the size of the intervals between the strings and between the numbers is known. An instrument with nine strings may well be systemically pentatonic. For instance, the galoubet from the French Provence is a duct flute with just three holes, only two of them visible (the third is on the other side of the instrument), has a span of two octaves and is systemically heptatonic.

A series of pitches, perhaps a melody, excavated from the Antiquity, which therefore can only be analysed in its written form, cannot be identified as pentatonic, heptatonic, enneatonic, or whatever,

without the formal evidence for the construction of the system into which it is inscribed. Western identification principles depending on specific formulations, such as the return to the tonic, or the relationship of the leading to the tonic pitch, are irrelevant in the exploration of the earliest music systems.

So what constitutes the evidence of a system? Take Euclid (fl. 300 BC) for example, theorem XVII of his division of the monochord. In my simplified translation it says: take A. Tune a fourth above (D), then tune a fifth below (G) then tune a fourth above (C), then tune a fifth below (F)[10]. This generates F - G - A - C - D. The alternation of two descending fourths and two ascending fifths suggest a heptatonic construction but it is not as it stops at D. The two Just tones F-G and G-A suggest Pythagorean ditonism[11]. However, F does not lead to another ascending fourth, B flat. Therefore, this is neither evidence of a heptatonic construction no more than it is the evidence of the construction of a Pythagorean fourth.

On the other hand, the enunciation of U.3011, object of the previous chapter, clearly sets the principles of an enneatonic system and its evolution from a Sumerian forerunner to an evolved Babylonian form. Enneatonism is therefore proven with this text, as heptatonism will be proven, on account of its construction, clearly and indubitably formulated, in text CBS 1766 that we shall see later in this book.

X - Linearity and cyclicity

There are two conceptual geometric arrangements of pitch structures in Ancient Near-Eastern Antiquity. The first one which is linear, is the oldest and dates from the dawn of history; and the second, which appears during the first millennium BC, is cyclical.

a) Linearity

A linear system is one where the representation of its constitutive pitches follows the pattern of the strings as they are placed on the yoke of the lyre, an archetypical instrument. The strings are placed one after the other, in a line and in specific directions, ascending, descending or palindromic[12]. For instance, the iconography of the lyres in the Ancient Near-East and in other later cultures display strings in a linear order which finds its equation with texts such as U.3011, explored in the preceding chapter.

The seven strings of the early Greek classical lyre were also the names of the pitches they represented: *Nētē*; *Paranētē*; *Tritē*; *Mesē*; *Lichanos*; *Parhypatē*, and *Hypatē* meaning 'bottom'; 'alongside-bottom'; 'third'; 'middle'; 'forefinger'; 'alongside-topmost', and 'topmost'. The terms *Nētē*; *Paranētē*; *Tritē*; *Mesē* bear a striking similarity with the Babylonian setting, as both are symmetric and have terms in common. Note that the *Mesē* was probably the tonal centre, as was the fifth string of the Babylonian lyre. This concept lasted up to the Western Renaissance, significantly.

Thus not only the Sumerian system was linear but it was also, initially, palindromically symmetric with the fifth string-pitch, the smallest in length, being the tonal centre of the system, the other

10 In his translation of Euclid's ascribed *Division of the Canon*, Théorème XVII, Ch.Em. Ruelle translates: Soit B une mèse; surtendons à la quarte en G, [...] et à partir de G, relâchons à la quinte en D., etc. Ruelle's translation is sufficiently reliable to make it clear that both pitches of an interval are not played together, but one after the other. This supports the hypothesis in CBS 10996, that both pitches of an interval were not played simultaneously, but consecutively.

11 A Pythagorean ditonic fourth is constructed by alternation of ascending fourths and descending fifths and generated a series made up of two consecutive Just tones and a Pythagorean semitone (9:8-9:8-256:243).

12 The palindromic order is typical of earliest lyres from the Uruk/Jemdet Nasr period where the shortest string is in the middle of the set with the other strings placed in a fan-like disposition on both sides of the middle string. In the Middle-East, systems are usually descending. Around 2600BC, the strings shift: the shortest string remains at the centre of the yoke from which the other strings 'descend' in progressive order of length towards the musician.

strings spreading on each side of the tonal pitch, one side ascending to it and the other descending from it, the ascending pitches mirroring the descending pitches. Then around 2600 BC the string pattern changed with the shortest string remaining in the middle, but where all the others descended from it towards the musician.

The fourth millennium palindromic system would have been: a-g-f-e-d-e-f-g-a. The asymmetric order from 2600 BC would have been: a-g-f-e-d-c-b-a-g. Both symmetric and asymmetric orders would have had similar intervals sizes between their strings and therefore remained symmetric in their own manner:

Late fourth millennium symmetric: a (T) g (T) f (1/2) e (T) d (T) c (1/2) b (T) a (T) g

Early third millennium asymmetric: a (T) g (T) f (1/2) e (T) d (T) c (1/2) b (T) a (T) g

It is very probable that during the early fourth millennium BC the system would have been pentatonic with the following arrangement where 'd' was the tonal pitch, but was placed at the treble most pitch:

d (T) c (3-) a (T) g (3-) e (T) d (T) c (3-) a (T) g

Then 'd' became the central tonal pitch. This might explain the Sumerian term '**sa.di**' used both for the first and the fifth strings in text U.3011. The tonic pitch would have shifted from the first to the fifth position and inversely in the course of musicological developments.

b) cyclicity

As the science of musicology varied with time, Babylonian theoreticians realised that however perfect might have been their linear symmetric enneatonic system, it nevertheless hosted seven descending fifths and seven ascending thirds, and, as we shall see later text U.7/80, gives instruction for the construction of seven scales, eight with the first being replicated at the end of the cycle, a semitone higher. However, each scale has nine pitches. In fact, I contend that the emergence of diatonism led them to the conclusion that cyclicity and heptatonism were inextricable. They realised that if they bent their linear system into a circle, the two extreme, or opposite pitches, 'a' and 'g' would overlap each other becoming obsolete, as illustrated below.

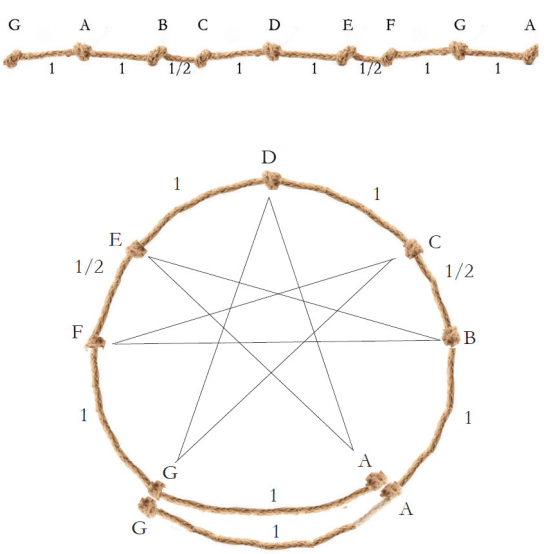


Figure 2. linear enneatonic translation of enneatonism cyclic heptatonism.

XI - Linear and cyclical confusion

Astonishingly, while earliest publication of text CBS10996 described it as a heptatonic, therefore cyclical, it was linearity that was used to describe it as shown below[13].

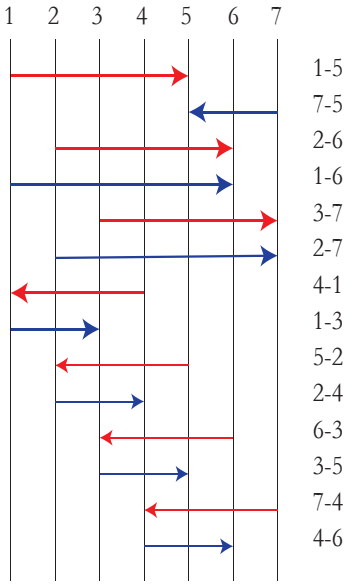


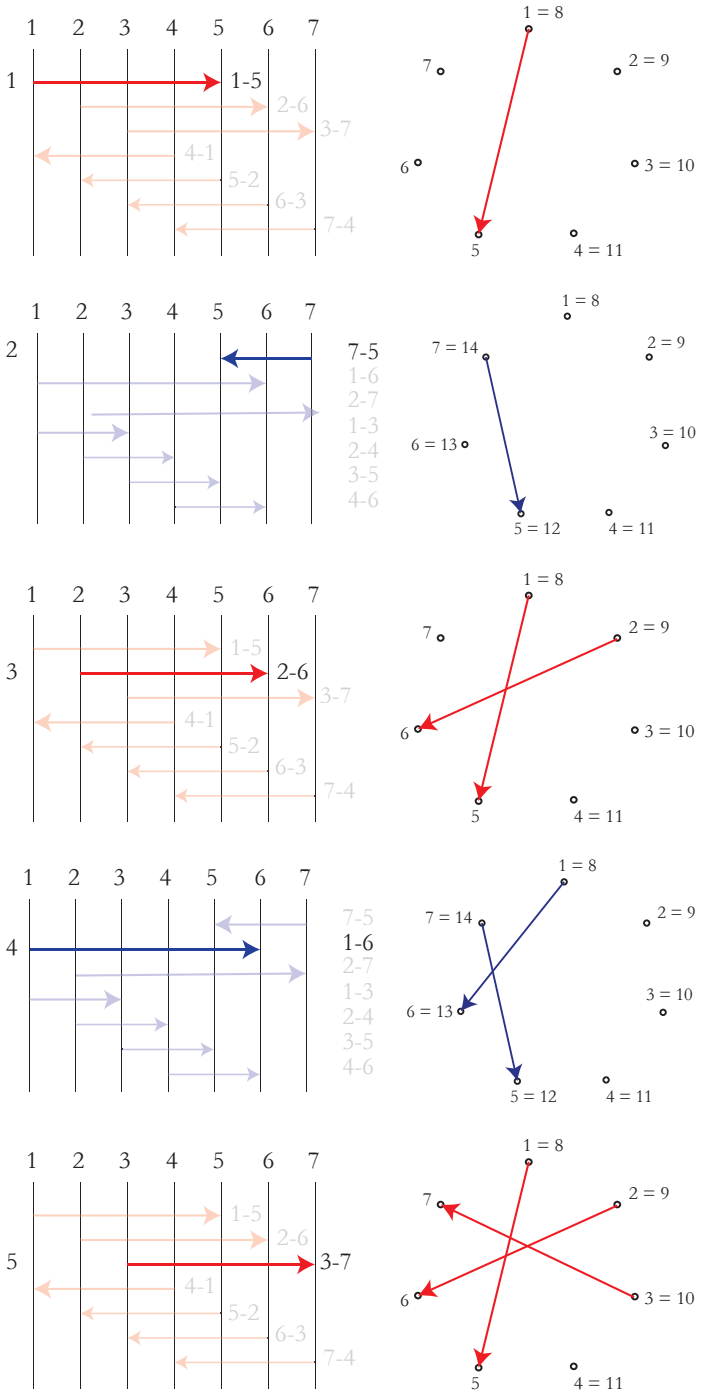
Figure 3. linear enneatonic translation of enneatonism cyclic heptatonism.

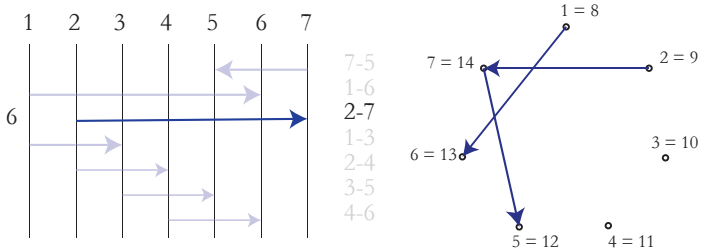
This shows that many musicologists and Assyriologists were and are still very confused about the intricacies of exo-Occidental musicology as while promoting universal and intemporal heptatonism, as a consequence of cyclicity, they insisted and still insist in representing it linearly. This contradiction is incomprehensible.

The diagrams which follow will describe my reconstruction of CBS10996 to show its relation to the original text where most musicologists/Assyriologists found irrevocable heptatonism, in the hope that they will understand that heptatonism is in fact part of the larger enneatonic system which itself is part of a greater span of thirteen and possibly seventeen consecutive pitches.

13 Kilmer, The Discovery of an Ancient Mesopotamian Theory of Music, in *Proceedings of the American Philological Society*, Vol.115, No. 2 (1971), pp. 131-49.

Comparative linear and cyclical interpretation of CBS 10996

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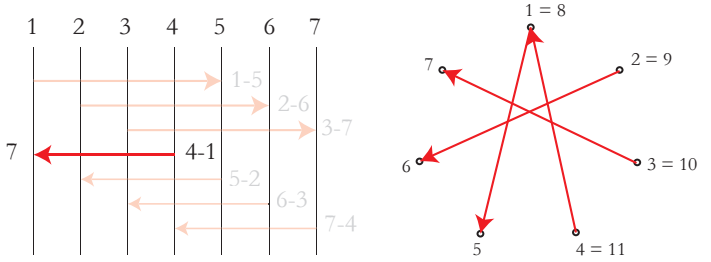
3 = 10
5 = 12
4 = 11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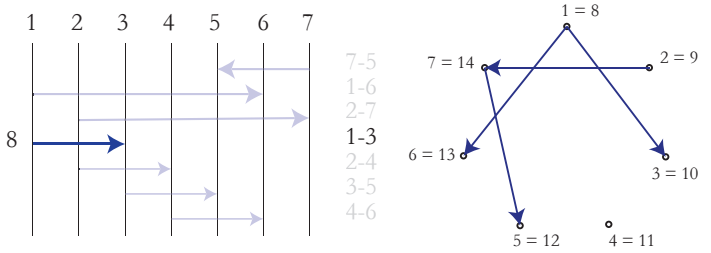
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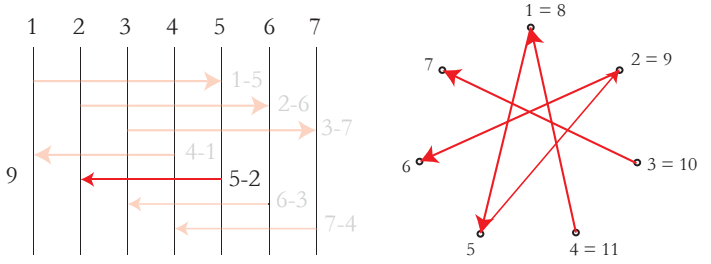
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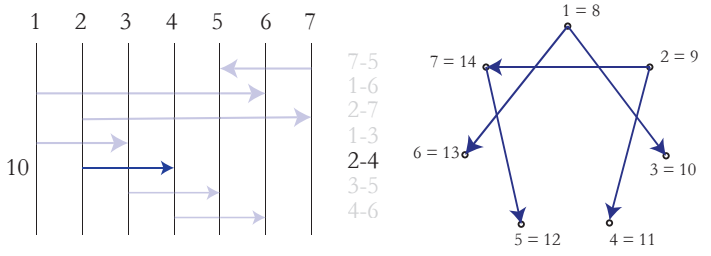
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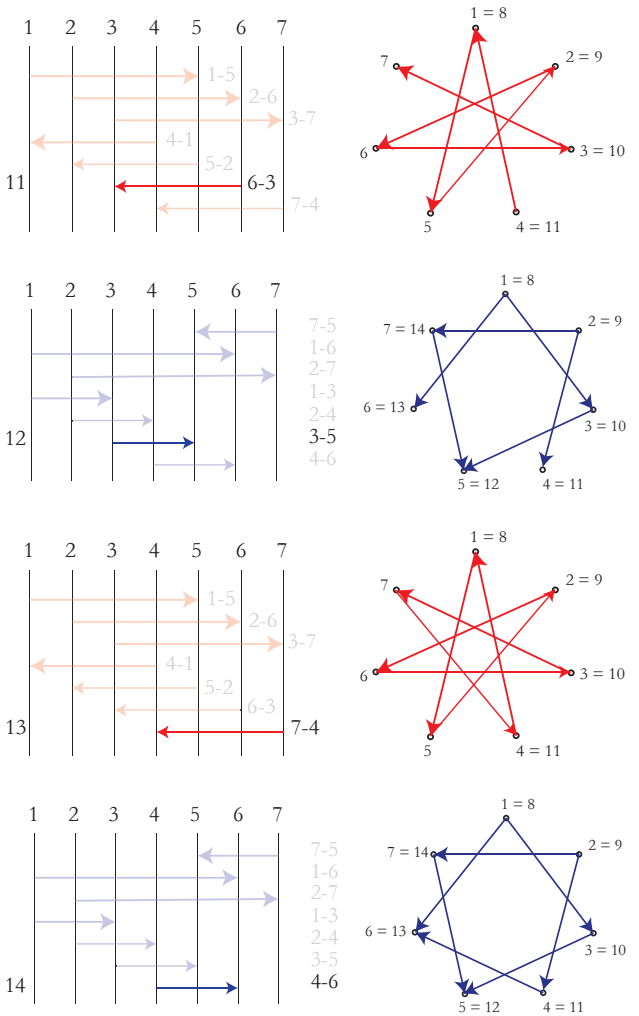


This comparison of the interpretation of text CBS 10996, in linear and cyclical dispositions, shows that the cyclical system keeps a regular order of the intervals, restricted to fifths and thirds, and spread onto the ambitus of thirteen pitches, in agreement with text U.3011. On the other hand, the linear interpretation, adopted by most Assyriologists and musicologists in the early sixties, was as arbitrary as it was irrational because although their authors, while claiming that the system described in CBS 10996 was heptatonic therefore cyclical, used a linear transliteration, incomprehensibly, to describe it - probably to support their assumptions, as the cyclical interpretation would have invalidated their interpretation, unequivocally.

The linear interpretation shows inversions of intervals so that they may adapt to a heptachord, while the cyclical disposition shows that while respecting the heptachordal disposition, it spreads it within the tridecatonic span.

Had text CBS10996 been originally intended to describe a heptatonic system, then it would have been conceived in a much better arrangement, probably spreading onto two octaves. That it is restricted to seven pitches shows that it was most likely intended to be a school exercise about the reduction of a tridecatonic system onto a heptachordal instrument, but certainly did not represent

a standard attestation of the heptatonic system, no more than it represented a set of intervals from which musicians could build up their compositions.

The following illustration compares the graphic representation of U.3011 (top) to my reconstruction of CBS10996 (bottom).

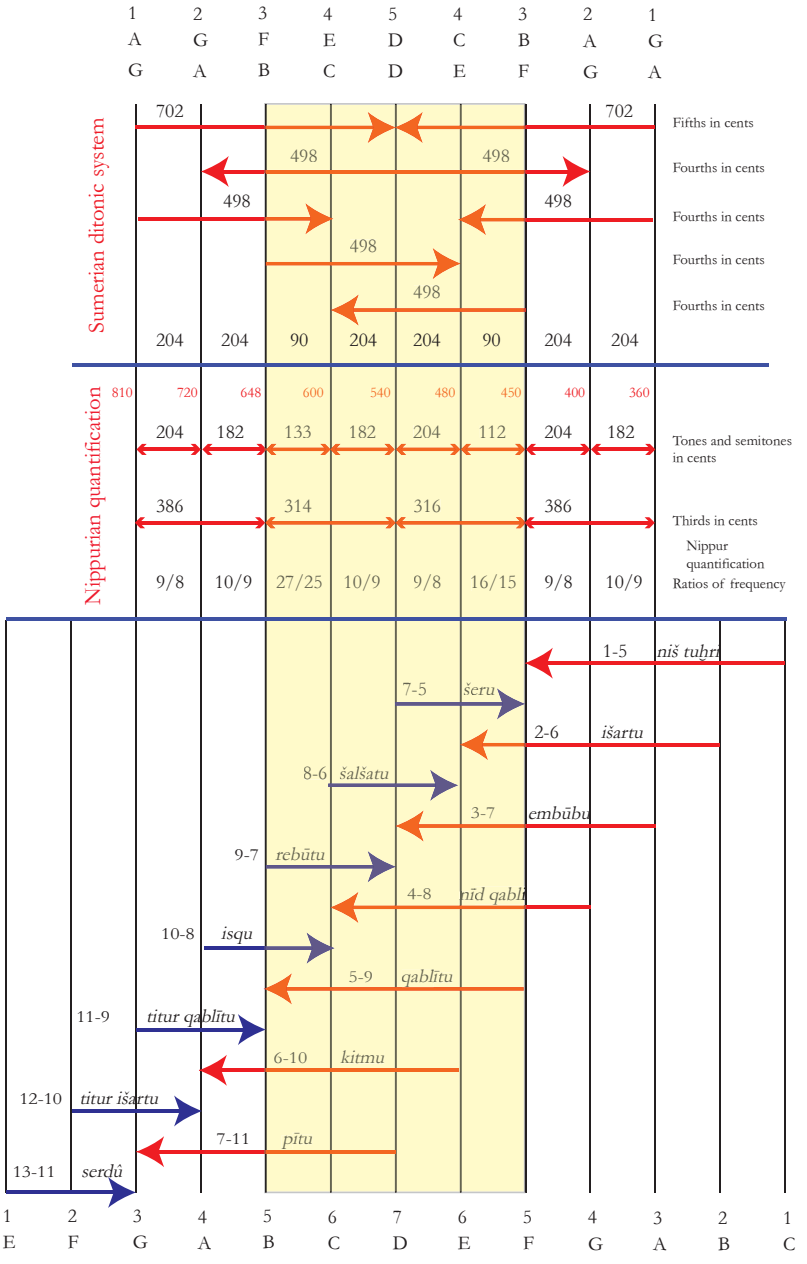


Figure 6. Top, Sumerian ditonism; below, Nippurian quantification in relation to the tridecachoral span in U.3011. The area shaded in yellow places the diminished fifth, *qablītu*.

Approximation of the pitches of the intervals in CBS 10996

1-5 *niš tuḫri*	=	c-b-a-g-f*	(fifth)
7-5 *šeru*	=	d-e-f	(third)
2-6 *išartu*	=	b-a-g-f-e	(fifth)
8-6 *šalšatu*	=	c-d-e	(third)
3-7 *embūbu*	=	a-g-f-e-d	(fifth)
9-7 *rebūtu*	=	b-c-d	(third)
4-8 *nīd qabli*	=	g-f-e-d-c	(fifth)
10-8 *isqu*	=	a-b-c	(third)
5-9 *qablītu*	=	f-e-d-c-b	(fifth)
11-9 *titur qablītu*	=	g-a-b	(third)
6-10 *kitmu*	=	e-d-c-b-a	(fifth)
12-10 *titur išartu*	=	f-g-a	(third)
7-11 *pītu*	=	d-c-b-a-g	(fifth)
13-11 *serdû*	=	e-f-g	(third)

* Note: as aforementioned that the Western pitches have only an indicative value but are not intended to claim that the Babylonian intervals equated Western pitch quantification.

The quantification of the intervals as they stand in their heptachordal compression consists in the inversion of intervals of original pitches spreading beyond the heptachord:

1-5 *niš tuḫri* = c-b-a-g-f*; 7-5 *šeru* = d-e-f; 2-6 *išartu* = b-a-g-f-e; 1-6 *šalšatu* =c-b-a-g-f-e (inversion of c-d-e); 3-7 *embūbu* = a-g-f-e-d; 2-7 *rebūtu* = b-a-g-f-e-d (inversion of b-c-d); 4-1 *nīd qabli* = g-a-b-c (inversion of g-f-e-d-c); 1-3 *isqu* = c-b-a (inversion of a-b-c); 5-2 *qablītu* = f-g-a-b (inversion of f-e-d-c-b); 2-4 *titur qablītu* = b-a-g (inversion of g-a-b); 6-3 *kitmu* = e-f-g-a (inversion of e-d-c-b-a); 3-5 *titur išartu* = a-g-f (inversion of f-g-a); 7-4 *pītu* = d-e-f-g (inversion of d-c-b-a-g); 4-6 *serdû* = g-f-e (inversion of e-f-g).

Conclusion

Since the sixties, musicologists blindly accepted the hypothesis that the intervals in CBS 10996 were harmonic and evidential of a heptatonic system consisting of a series of harmonic intervals of thirds, fourths, fifths and sixths - basis of a rather peculiar system of musical composition which ignored the precedence of melody, beyond any reasonable musicological cause. However, there is absolutely no evidence for any of these assumptions in this text.

It took centuries before the human ear recognized consonant harmonic intervals, and therefore, is it really reasonable to assume that Babylonians did, against all odds, some four thousand years ago and that none of it survived - while all other scientific feats did - especially in a land which to this day remains resolutely monodic in its expression, and probably has been for millennia.

Even if puzzled by these assumptions, musicologists, students and other readers thought these scholars must be right and therefore did not question the proof of the evidence upon which it rested. They thought that if the system was heptatonic, with harmonic intervals, then the text must have said so, indubitably. But this is not what was written. They had been misguided: whether this was by ignorance or by design is left to your own appreciation.

U. 7/80 (UET VII 74) 1800 BC
(Metabolisation of dynamic sets into thetic sets)

Figure 1. Cast of U.7/80 at the British Museum, photograph by the author.

Right column

[*šum-ma* ^{giš}**ZÀ.MÍ** *pi-i-tum-ma*]

1 [*e-e*]*m-b*[*u-bu-um la za-ku*]
2 *ša-al-š*[*a-am qa-at-na-am tu-na-sà-aḫ-ma*]
3 *e-em bu-bu-u*[*m iz-za-ku*]
4 *šum-ma* ^{giš}**Z**]**À.MÍ** *e-em-bu-bu-um-ma*]
5 *ki-it-mu-um* [*la za-ku*]
6 *re-bi úḫ-ri-im* [*tu-na-sà-aḫ-ma*]
7 *ki-it-mu-um i*[*z-za-ku*]
8 *šum-ma* ^{giš}**ZÀ.MÍ** *k*[*i-it-mu-um-ma*]
9 *i-šar-tum la za-*[*ka-at*]
10 *ša-mu-ša-am ù-úḫ-ri-a-a*[*m tu-na-sà-aḫ-ma*]
11 *i-šar-tum iz-za-*[*ku*]
12 *nu-su - ḫ*[*u-um*]
13 *šum-ma* ^{giš}**ZÀ.MÍ** *i-šar-t*[*um-ma*]
14 *qa-ab-li-ta-am ta-al-pu-*[*ut*]
15 *ša-mu-ša-am ù-úḫ-ri-a-am te-*[*ni-e-ma*]
16 [^{giš}]**ZÀ.MÍ** *ki-it-mu-*[*um*]
17 [*šum*]*-ma* ^{giš}**ZÀ.MÍ** *ki-it-m*[*u-um-ma*]
18 [*i-ša*]*r-ta-am la za-ku-ta-am t*[*a-al-pu-ut*]
19 [*re-bi*] *úḫ-ri-im te-ni-e*[*-ma*]
20 [^{giš}**ZÀ.MÍ** *e-em-bu-bu-um*]

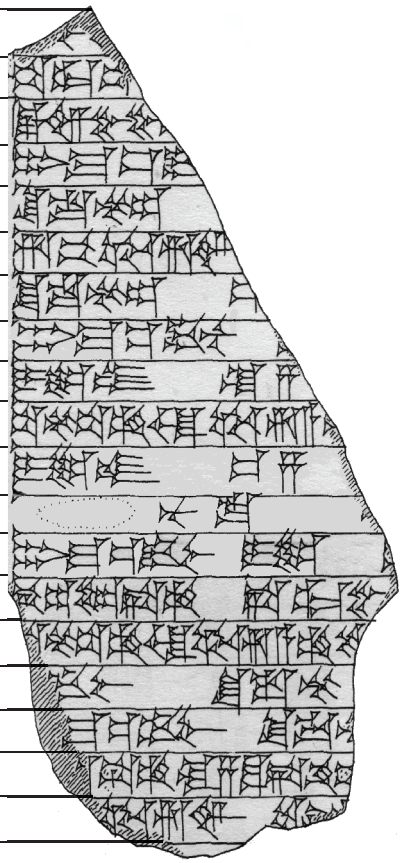


Figure 2. Transliteration of Gurney's hand copy of the right column

Introduction

U.7/80 dates from the Old-Babylonian period, about 1800 BC. It was unearthed by Sir Leonard Woolley at Ur[1] in the nineteen-twenties. Professor Gurney published it some forty years later, in 1968[2]. At that time no one had yet thought that the scale might be descending and in spite of my attempts at promoting the idea on the basis of Greek, Oriental and other models, I was ignored. After having asked advice from the then Oxford musicologist David Wulstan, Gurney published his paper, taking the system as if it were ascending.

1 Gurney, O.R., *Ur Excavation Texts. Publication of the Joint Expedition of the British Museum and of the University Museum of Pennsylvania, Philadelphia*, Volume VII, *Middle Babylonian Legal Documents and other texts.* Published for the Trustees of the British Museum, (1973), Pl .74.

2 Gurney, O.R., An Old Babylonian Treatise on the Tuning of the Harp. *IRAQ* XXX, (1968), pp. 229-33.

Then, in 1982, the Syrian Raoul Gregory Vitale[3] also advanced that the system was descending but was likewise ignored. Finally, in 1990, Assyriologist colleague and friend Th.J.H. Krispijn perceived a new reading of line 12 as *nu-su-ḫ*[*um*, a form of the verb *nasāḫum*, 'to tighten'. This new term *nasāḫum*, Sumerian **gíd-i**, or *nussuḫum*, Sumerian **zi-zi**, is the technical verb for 'to tighten' strings. Its antonym is *ne'ûm*, Sumerian **tu-lu**. Subsequently Gurney published another paper in 1994[4] where it was finally agreed, almost generally, that the Babylonian system was descending because the strings were tightened in the first part and loosened in the second. So, it was philology which won the case for musicology.

A reminder of U.3011 (*Nabnītu* xxxii) and CBS 10996

Text *nabnītu* xxxii, (U.3011 henceforth) which was discussed in the first chapter of this book, is a nomenclature of the pitches of an enneatonic generative pitch set[5] which is made up of two conjoined stepwise fifths: *embūbum* and *pītum* or a-g-f-e-d and d-c-b-a-g, respectively, amounting to the pitch set of *pītum* or a-g-f-e-d-c-b-a-g. In full: ['**sa.di**; **sa.úš**; **sa.3.sa.sig**; **sa.4.tur**; **sa.di.5**'] and ['**sa.di.5**; **sa.4.a.ga.gul**; **sa.3.a.ga.gul**; **sa.2.a.ga.gul**; **sa.1.a.ga.gul.la**']. Numerically it is: 1^{f}-2^{f}-3^{f}-4^{f}-5-4^{r}-3^{r}-2^{r}-1^{r}, where superscripted suffix '^{f}' indicates '(string)-of the **front**', and superscripted suffix '^{r}' indicates '(string)-of the **rear**'. However, this set must never be numbered 1-2-3-4-5-6-7-8-9, either in U.3011, CBS 10996 or with U.7/80, because strings are never numbered in this manner in any of these texts, beyond any reasonable doubt. Therefore, should anyone insist to number these strings from one to nine (1-2-3-4-5-6-7-8-9), this would amount to blatant falsification of the evidence with the intent of suggesting that Babylonian pitch sets are made of seamless series of nine pitches into which falsifiers located heptatonism and octaves to fit in with their misguided assumptions. Had they correctly transliterated and translated what is really written, they would have realised that their assumptions were wrong. Furthermore, it remains incomprehensible that while they recognised the Ancient Greek construction of two conjoined or disjoined tetrachords, amounting to a heptatonic or to an octatonic pitch set, respectively, they rejected the hypothesis of a Babylonian enneatonic pitch set of two conjoined pentachords. The reason is that it did not suit their ideologically fuelled universal heptatonism, and decreed that therefore, a Babylonian heptatonic pitch set would somehow be floating within a span of nine strings, and while there were nine strings listed, it was seven that was meant.

In his *Ancient Greek music*[6], West writes:

> '*...most of the fifth-century scales of which we have any knowledge did not exceed the octave. One of them, however, the Dorian of the Damonian set extended over a ninth. It incorporated two disjunct tetrachords plus a further note a tone below Hypatē. The lower part of the Phrygian Scale had a similar structure*[7]. [both amounting to an enneachord[8]]'.

3 Vitale, R.G., La Musique suméro-accadienne: gamme et notation musicale. *Ugarit-Forschungen* 14 (1982), pp. 241–63; La tablette musicale H-6. *Archéologies Arabe Syriennes* 29-30 (1979-1980).

4 Gurney, O.R., Babylonian Music Again. *IRAQ* LVI, (1994), pp. 101-6.

5 A generative pitch set, is a paradigmatic series of pitches from which other sets may be built. The various sets issuing from a generative set amount to a system. U.3011 is a generative pitch set and the instructions given in text U.7/80 lead to a system.

6 West, M.L., *Ancient Greek Music*, Clarendon, Oxford (1992), p. 220-1.

7 West's footnote says: Thrasyllus ap. Theon, Smyrn. p. 88. 18ff., Boeth. *Inst. Mus.* 1. 20, cf. Aristid. Quint. p. 8 12. In the curious document called the *Common Hormasia* (Pöhlmann, *DAM* 32f.) it is called *diapemptos*, 'at the fifth' (from Mesē downwards). Cf. Winnington-Ingram, *Mode* 25.

8 Author's note.

The right column

The tablet is badly damaged with its sides broken away. However, the text was restored by means of extrapolation on the basis that line 12 appears to be the axis from which lines 13 to 16 flow in symmetry with lines 8 to 11 (the only remaining lines). Therefore, we take it that the instructions in this text are set in quatrains and exhibit a pattern similar to the symmetry in the left column of U.3011. The diagram below illustrates this analogy (fig. 4).

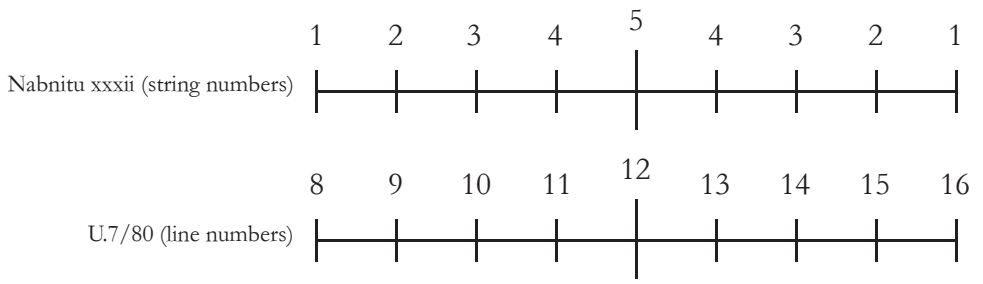


Figure 4. Systemic analogy between U.3011 and U.7/80.
Note that the numbers for the representation of U.7/80 are the line numbers of the text and not string numbers (which can be substituted to the string numbers in U.3011).

Therefore, the system described, in U.3011 and prescribed in U.7/80, are linear descending[9] diatonic and enneatonic. They validate each other. However, and despite of the symmetric nature of the instructions given in the two quatrains sitting on each side of the axis of symmetry (line 12), it would have been impossible to say how the text started or finished. Yet, it was on the basis that the first fifth (1-5) in CBS 10996 is *niš tuḫrim*, that I hypothesized that U.7/80, too, would have started with fifth *nīš tuḫrim*, conjoined to fifth *qablītum* which is the enneatonic pitch set of *išartum.*

Thus we uphold that U.7/80 gives instructions for the construction of a series of seven descending enneatonic pitch sets sharing the names of the seven fifths in U.3011. It would be reasonable to assume that terms would have distinguished them.

U.7/80 is further evidence of the remarkable creative genius of Babylonian scholarship. The method prescribed in this system was never equalled by any other civilization as it translates a dynamic disposition into its thetical[10] form.

9 They are descending insofar as we take the Nippur numbers as quantifications of frequency, from 810 to 360.

10 Thetic means 'set down or stated positively or absolutely'. From Greek '*thetikos*' = that can be placed < '*tithenei*' = to place. It describes sets translated from the dynamic layout in a disposition prescribed in text U.7/80. It is the opposite of dynamic, from Greek '*dynamikos*', 'powerful'. It describes the layout of pitches as in the Greater Babylonian System. Dynamic a-b-c-d-e-f-g-a is thetic c-d-e♭-f-g-a♭-b-c, in case the thetic is set on the scale of 'c' with accidentals added according to a given dynamic scale.

We shall now analyse what the text says:

- Each sequence is written in the form of a quatrain.

The quatrain starting at line 4:
- The first line says that if the **ZÀ.MÍ**-instrument is (tuned) in a given manner.
- The second line locates a '*la zaku'* interval *by name only.*
- The third line instructs which string(s) should be tensioned.
- The fourth line says that as a result of the tension of the aforementioned string(s), the '*la zaku'* interval has been made '*iz-za-ku'*.

The quatrain starting at line 8:
- That the **ZÀ.MÍ**-instrument is (tuned) in the subset which was previously corrected.
- The second line locates a '*la zaku'* interval *by its name only.*
- The third line instructs which string(s) should be tensioned,
- The fourth line says that as a result of the tension of the aforementioned string(s), the '*la zaku'* interval has been made '*iz-za-ku'*.

At line 13 the process is reversed.

A particularity of diatonism is that as a consequence of its construction, it hosts a fifth which does not 'sound right'. In the pitch described in Nabnitu xxxii, this interval sits right in the middle of the series and is appropriately called *qablītum* meaning 'part of the middle'. The Babylonians defined this interval as '*la zaku*' meaning 'unclear'. It would be tempting to call it a 'tritone' however, its size is atypical. '*la zaku*' equals to 648/450 = 36/25 = 632 cents, which is the Acute Diminished Fifth (for comparison purposes, 612 cents is the Pythagorean tritone, and 600 is the Equal Tritone).

Gurney's transliteration says:

[*šum-ma* ^{giš}**ZÀ.MÍ** *pi-i-tum-ma*]
1 [*e-e*]*m-b*[*u-bu-um la za-ku*]
2 *ša-al-š*[*a-am qa-at-na-am tu-na-sà-aḫ-ma*]
3 *e-em bu-bu-u*[*m iz-za-ku*]

4 *šum-ma* ^{giš}**Z**]**À.MÍ** *e-em-bu-bu-um-ma]*
5 *ki-it-mu-um* [*la za-ku*]
6 *re-bi úḫ-ri-im* [*tu-na-sà-aḫ-ma*]
7 *ki-it-mu-um i*[*z-za-ku*]

8 *šum-ma* ^{giš}**ZÀ.MÍ** *k*[*i-it-mu-um-ma*]
9 *i-šar-tum la za-*[*ka-at*]
10 *ša-mu-ša-am ù-úḫ-ri-a-a*[*m tu-na-sà-aḫ-ma*]
11 *i-šar-tum iz-za-*[*ku*]

12 *nu-su-ḫ*[*u-um*]

13 *šum-ma* ^{giš}**Z**]**À.MÍ** *i-šar-t*[*um-ma*]
14 *qa-ab-li-ta-am ta-al-pu-*[*ut*]
15 *ša-mu-ša-am ù-úḫ-ri-a-am te-*[*ni-e-ma*]
16 [^{giš}]**ZÀ.MÍ** *ki-it-mu-*[*um*]

17 [*šum*]*-ma* ^{giš}**ZÀ.MÍ** *ki-it-m*[*u-um-ma*]
18 [*i-ša*]*r-ta-am la za-ku-ta-am t*[*a-al-pu-ut*]
19 [*re-bi*] *úḫ-ri-im te-ni-e!*[*-ma*]
20 [^{giš}**ZÀ.MÍ** *e-em-bu-bu-um*]

N.B. Certain words in this transliteration have a final mimation, an '*m*' following the case ending of a word, i.e. *išartum* instead of *išartu*. This practice is typical of the Old-Babylonian period.

Below is Gurney's translation of his reconstruction of the text. I have added my corrections in red and my commentaries in blue.

(The superscript 'r' in red means 'rear' for 'rear-string' and the superscript 'f' in red means 'fore', for 'fore/prime-string'.)

First part
1. If [11] the harp is *išartum*
the 'unclear interval' between strings 5 and 2 is *qablītum* (the text says 5-1^{r})
tighten by a 'semi-tone'[12] string 5
the harp will be *qablītum*

Commentary: This first quatrain of the first part was reconstructed by Professor Gurney. My interpretation is that the set of *išartum* comes from the conjunction of fifths *nīš tuḫrim* and *qablītum* = c-b-a-g-f + f-e-d-c-b as explained in my reconstruction of CBS 10996. But the 'unclear interval' is not between strings '5' and '2' (although in theory it exists as an 'unclear' fourth at that position) but between '5' (*ḫa-am-šu*) and the '1 behind string' (*úḫ-ru-um*), an 'unclear' fifth. Now, that it was strings '5' and '2 of the front' which located the 'unclear interval' would not have been written as such in the original text. It would have said that *qablītum* is *la zaku* which means 'unclear', i.e. unpleasant. The substitution of string '1 of the behind' to '2 of the front' is the consequence of the erroneous reading of CBS 10996, and is used to suggest heptatonism.

2. If the harp is *qablītum*
the 'unclear interval' between strings 1 and 5 is *nīš tuḫrim*
tighten strings 1 and 8 (the text says 1^{f}-2^{r})
the harp will be *nīš tuḫrim*

Commentary: The set *qablītum* comes from the conjunction of fifths *qablītum* and *išartum* = f-e-d-c-b + b-a-g-f-e. Therefore, the 'unclear interval' is between strings '1 of the front' and '5'. The reconstruction says that strings 1 and 8 should be tuned-up by a 'semi-tone'. But it should be written that it is string 1 of the front and string 2 of the back which should be tuned-up.

11 The Akkadian term *šumma* has been consistently mistranslated by 'when' although it should be the conditional 'if'. It was argued that it meant the same thing. The Babylonians were keen on the usage of protasis and apodosis, that is the formula: If….., then.

12 The text does not say 'semi-tone'. It is an amount by which the 'unclear interval' is corrected. This quantity is unknown as the system does not rely on ratios and therefore is probably left to the appreciation of the musician's tonal memory. I shall replace the term by 'tighten'.

3. If the harp is *nīš tuḫrim*
the 'unclear interval' between strings 4 and 1 is *nīd qablim* (the text says 4^{f}-2^{r})
tighten string 4
the harp will be *nīd qablim*

Commentary: The set *nīš tuḫrim* comes from the conjunction of fifths *išartum* and *kitmum* = b-a-g-f-e + e-d-c-b-a. The reconstructed text says that the 'unclear interval' is between strings '4 of the front' and '1 of the front'. Here again, it should be placed between strings '4 of the front' and string '2 of the back'.

4. If the harp is *nīd qablim*
the 'unclear interval' between strings 7 and 4 is *pītum* (the text says 3^{r}-4^{f})
tighten string 7
the harp will be *pītum*

Commentary: The set *nīd qablim* comes from the conjunction of fifths *kitmum* and *embūbum* = e-d-c-b-a + a-g-f-e-d. Here, the limitation of the span for the set places the 'unclear interval' *pītum* between strings '3 of the behind' and '4 of the front' and it is string '3 of the behind' which must be tuned-up.

5. If the harp is *pītum*
the 'unclear interval' between strings 3 and 7 is *embūbum* (the text says 3^{f}-3^{r})
tighten string 3
the harp will be *embūbum*

Commentary: The set *pītum* comes from the conjunction of fifths *embūbum* and *pītum* = a-g-f-e-d + d-c-b-a-g. The transliteration of the tablet, since this is where the text U.7/80 starts, says that the 'unclear interval' *embūbum* is placed between strings '3 of the front' and string '3 of the behind' and that string '3 of the front' should be tuned-up.

6. If the harp is *embūbum*
the 'unclear interval' between strings 6 and 3 is *kitmum* (the text says 4^{r}-3^{f})
tighten string 6
then the harp will be *kitmum*

Commentary: The set *embūbum* comes from the conjunction of fifths *pītum* and *nīd qablim* = d-c-b-a-g + g-f-e-d-c. The 'unclear interval' is *kitmum.* It should be placed on strings 9-10 of the Greater System (Nabnitu xxxii).

7. If the harp is *kitmum*
the 'unclear interval' between strings 2 and 6 is *išartum* (the text says 2^{f}-4^{r})
tighten strings 2 and 9
the harp will be *išartum*

Commentary: The set *kitmum* comes from the conjunction of fifths *nīd qablim* and *nīš tuḫrim* = g-f-e-d-c + c-b-a-g-f. The 'unclear interval' *išartum* is located between strings 2 and 6, while it should be string '2 of the front' and string '4 of the back'.

The second part reverses the first part.

Gurney's translation and my commentaries have clearly shown how the numbering of the string-pitches from 1 to 9, which is not written in the original text, was used insiduously to induce heptatonism and octaves in a system where it does not exist.

The '*la zaku*' unclear fifths are located at the following positions in the various sets:

In the enneatonic *išartum*, the fifth *qablītum* is '*la zaku*'.	It is placed on 5-1^{r}
In the enneatonic *qablītum*, the fifth *nīš tuḫrim* is '*la zaku*'.	It is placed on 1^{f}-5
In the enneatonic *nīš tuḫrim*, the fifth *nīd qablim* is '*la zaku*'.	It is placed on 4^{f}-2^{r}
In the enneatonic *nīd qablim*, the fifth *pītum* is '*la zaku*'.	It is placed on 3^{r}-4^{f}
In the enneatonic *pītum*, the fifth *embūbum* is '*la zaku*'.	It is placed on 3^{f}-3^{r}
In the enneatonic *embūbum*, the fifth *kitmum* is '*la zaku*'.	It is placed on 4^{r}-3^{f}
In the enneatonic *kitmum*, the fifth *išartum* is '*la zaku*'.	It is placed on 2^{f}-4^{r}

The usage of British pitch names in this text is given only as an approximation of what the Babylonian enneatonic sets would have sounded. I have used it for the reason that it gives a better idea than a list of numbers. I will also give a quantification in musical cents which I have derived from the Nippur numbers. However speculative this might be, rather than saying that it could not have sounded the way I am proposing it, I would say why should it not? I am sure that we might meet somewhere in the middle. After all, why would the Babylonian system, at least in its tonal form, have sounded alien to us?

Thetical notation of U.7/80

Part 1

išartum (1):	c-b-a-g-f-e-d-c-b
qablītum:	c-b-a-c-f♯-e-d-c-b
nīš tuḫrim:	c♯-b-a-g-f♯-e-d-c-b
nīd qablim:	c♯-b-a-g♯-f♯-e-d-c♯-b
pītum:	c♯-b-a-g♯-f♯-e-d♯-c♯-b
embūbum:	c♯-b-a♯-g♯-f♯-e-d♯-c♯-b
kitmum:	c♯-b-a♯-g♯-f♯-e♯-d♯-c♯-b
išartum (2):	c♯-b♯-a♯-g♯-f♯-e♯-d♯-c♯-b♯

Part 2

išartum (2):	c♯-b♯-a♯-g♯-f♯-e♯-d♯-c♯-b♯
kitmum:	c♯-b-a♯-g♯-f♯-e♯-d♯-c♯-b
embūbum:	c♯-b-a♯-g♯-f♯-e-d♯-c♯-b
pītum:	c♯-b-a-g♯-f♯-e-d♯-c♯-b
nīd qablim:	c♯-b-a-g♯-f♯-e-d-c♯-b
nīš tuḫrim:	c♯-b-a-g-f♯-e-d-c-b
qablītum:	c-b-a-c-f♯-e-d-c-b
išartum (1):	c-b-a-g-f-e-d-c-b

Note that the last *išartum* (2) of the first part is not at the octave of the first *išartum*. It is a 'semitone' (of an undetermined value) higher. In the second part, *išartum* (1) is not equal to *išartum* (2). This means that there were eight enneatonic sets and not seven. However, the original text being broken at both the top and the bottom, it is impossible to say how *išartum* (1) of the first part was distinguished from the *išartum* (2) of the first part, and how *išartum* (1) of the second part was distinguished from *išartum* (2) of part 2.

Next follows the list of fifths and their conjunction into enneatonic sets, both in the dynamic (black) and in the thetic (red).

Part 1

Dynamic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b
Thetic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b
Dynamic fifths	*qablītum* + *išartum*	=	set of *qablītum*	= f-e-d-c-b-a-g-f-e
Thetic fifths	*qablītum* + *išartum*	=	set of *qablītum*	= c-b-a-g-f♯-e-d-c-b
Dynamic fifths	*išartum* + *kitmum*	=	set of *nīš tuḫrim*	= b-a-g-f-e-d-c-b-a
Thetic fifths	*išartum* + *kitmum*	=	set of *nīš tuḫrim*	= c♯-b-a-g-f♯-e-d-c♯-b
Dynamic fifths	*kitmum* +*embūbum*	=	set of *nīd qablim*	= e-d-c-b-a-g-f-e-d
Thetic fifths	*kitmum* +*embūbum*	=	set of *nīd qablim*	= c♯-b-a-g♯-f♯-e-d-c♯-b
Dynamic fifths	*embūbum* + *pītum*	=	set of *pītum*	= a-g-f-e-d-c-b-a-g
Thetic fifths	*embūbum* + *pītum*	=	set of *pītum*	= c♯-b-a-g♯-f♯-e-d♯-c♯-b
Dynamic fifths	*pītum* + *nīd qablim*	=	set of *embūbu*	= d-c-b-a-g-f-e-d-c
Thetic fifths	*pītum* + *nīd qablim*	=	set of *embūbu*	= c♯-b-a♯-g♯-f♯-e-d♯-c♯-b
Dynamic fifths	*nīd qablim* + *nīš tuḫrim*	=	set of *kitmu*	= g-f-e-d-c-b-a-g-f
Thetic fifths	*nīd qablim* + *nīš tuḫrim*	=	set of *kitmu*	= c♯-b-a♯-g♯-f♯-e♯-d♯-c♯-b
Dynamic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b
Thetic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c♯-b♯-a♯-g♯-f♯-e♯-d♯-c♯-b♯

Part 2

Thetic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c♯-b♯-a♯-g♯-f♯-e♯-d♯-c♯-b♯
Dynamic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b
Thetic fifths	*nīd qablim* + *nīš tuḫrim*	=	set of *kitmu*	= c♯-b-a♯-g♯-f♯-e♯-d♯-c♯-b
Dynamic fifths	*nīd qablim* + *nīš tuḫrim*	=	set of *kitmu*	= g-f-e-d-c-b-a-g-f
Thetic fifths	*pītum* + *nīd qablim*	=	set of *embūbu*	= c♯-b-a♯-g♯-f♯-e-d♯-c♯-b
Dynamic fifths	*pītum* + *nīd qablim*	=	set of *embūbu*	= d-c-b-a-g-f-e-d-c
Thetic fifths	*embūbum* + *pītum*	=	set of *pītum*	= c♯-b-a-g♯-f♯-e-d♯-c♯-b
Dynamic fifths	*embūbum* + *pītum*	=	set of *pītum*	= a-g-f-e-d-c-b-a-g
Thetic fifths	*kitmum* +*embūbum*	=	set of *nīd qablim*	= c♯-b-a-g♯-f♯-e-d-c♯-b
Dynamic fifths	*kitmum* +*embūbum*	=	set of *nīd qablim*	= e-d-c-b-a-g-f-e-d
Thetic fifths	*išartum* + *kitmum*	=	set of *nīš tuḫrim*	= c♯-b-a-g-f♯-e-d-c♯-b
Dynamic fifths	*išartum* + *kitmum*	=	set of *nīš tuḫrim*	= b-a-g-f-e-d-c-b-a
Thetic fifths	*qablītum* + *išartum*	=	set of *qablītum*	= c-b-a-g-f♯-e-d-c-b
Dynamic fifths	*qablītum* + *išartum*	=	set of *qablītum*	= f-e-d-c-b-a-g-f-e
Thetic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b
Dynamic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b

The thetical process, however, presents a problem. No matter how inventive it was, almost four thousand years ago, and even if it still amazes today, it is amazing only insofar as it remains a theoretical device. We cannot imagine a temple or a court musician going through the process of tuning his instrument, in the course of a performance, from *išartum* to *embūbum*: Firstly, he would have to tune his instrument from *išartum* to *qablītum*; then from *qablītum* to *nīš tuḫrim;* them from *nīš tuḫrim* to *nīd qablim*; then from *nīd qablim* to *pītum*, and them, at last,

to *embubum*! This would have been an astonishingly cumbersome process which we believe, would have certainly impressed the theoretician elite but would have been worthless in practice. We take it that lyricists would have played only in few selected enneatonic DS and that complex transpositions would have been seldom required during a particular event.

Below is the Western notation representation of the first part of the system, both dynamic and thetic. The '*la zaku*' intervals are indicated in red and arrows lead to the subsets to which they give their name.

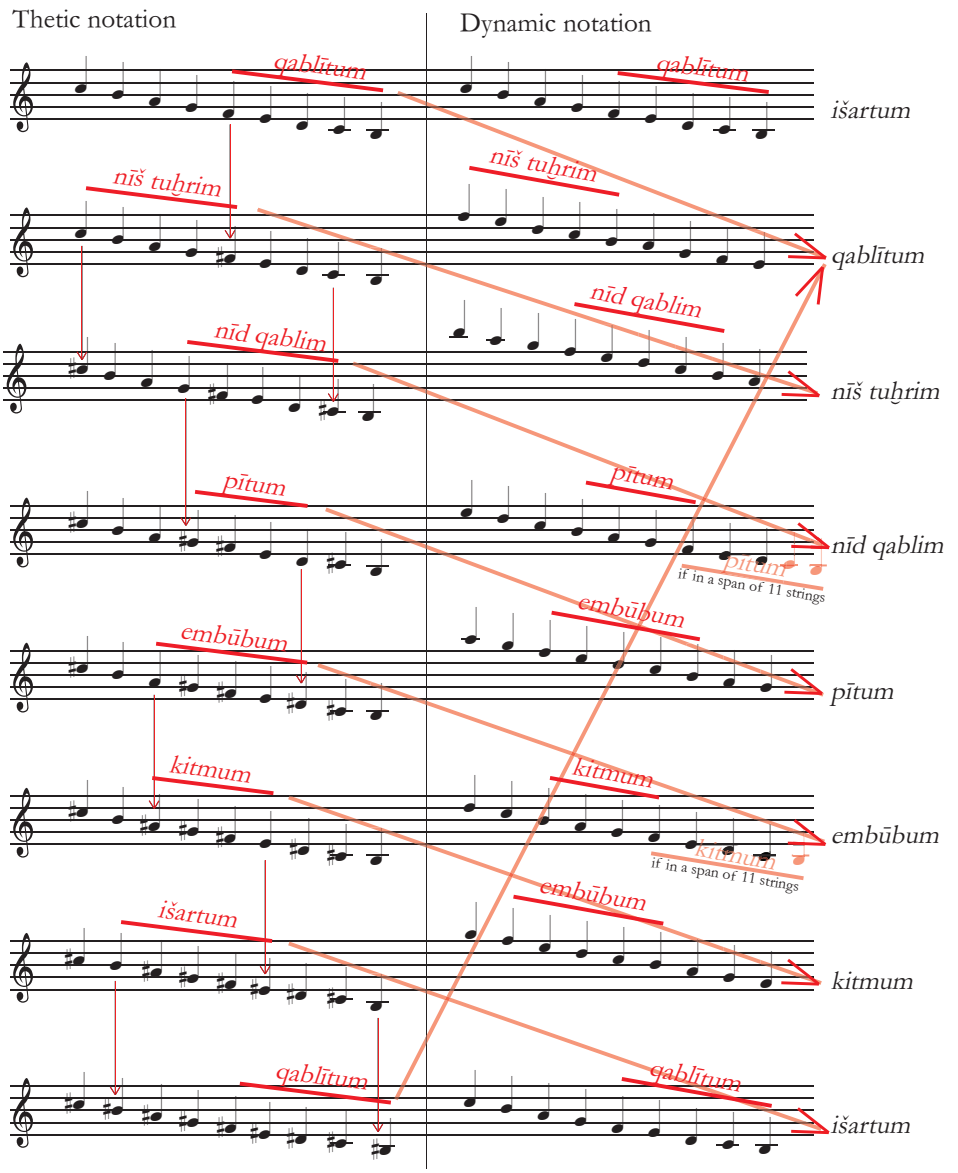
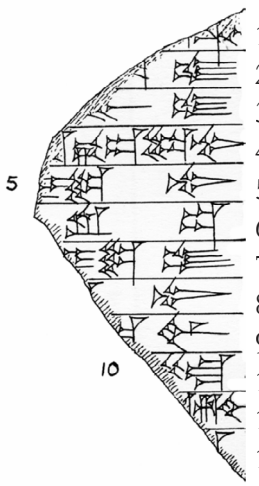


Figure. 5 Comparison of thetic (left) and Dynamic (right) sets showing metabolisation.

U.7/80 (UET VII 74) 1800 BC. (Left column)



1. [. . . . . *ú*]*ḫ*?-*ri*?-*im*
2. [. . . . .]-*tum*
3. [. . . . . *re-b*]*u-tum*
4. [. . . . . *ni-i*]*d*? *qà-ab-li-tim*
5. [. . . . .]*i-šar-tim*
6. [*úḫ*] - *ru* - *um*
7. [. . . . .] *i-šar-tum*
8. [. . . . .]-*tim*
9. [. . . . . *ṣ*/*zer-d*]*i-im*
10. [. . . . . *ki-it-m*]*u-um*
11. [. . . . . *u*]*ḫ-ri-im*
12. [. . . . .].

Figure 6, U.7/80, Gurney's hand copy and transliteration of the left column.

This tablet dates from the Old-Babylonian period, about 1800 BC. It was unearthed by Sir Leonard Woolley at Ur[1]. It has two columns. We shall analyse the left column first.

We shall take string/pitch numbers, intervals and sets as they appear in the generative system reconstructed from CBS 10996.

In the left column of U.7/80, lines 1, 6 and 11 must refer to three rear strings (4, 3 and 2) because the noun *uḫru* is in the genitive and that only in these three strings *uḫru* can be in the construct state: *ri-bi úḫ-ri-im*; *šal-ši úḫ-ri-im* or *ši-ni úḫ-ri-im*: fourth-string 'of the rear'; third-string 'of the rear'; second-string 'of the rear'.

At line 6, we take *úḫ-ru-um* as the adjective *uḫrû*, rather that the noun *uḫru*, 'rear'.

The other terms refer to interval names known from CBS 10996. Line 2 has the nominative (*t*)-*um*, and could be either *išartum*, *šalšatum*, *rebūtum* or *qablītum*, with intervals 2-6, 8-6, 9-7 and 5-9 respectively. Line 3 ending with *b*]*u-tum* could only belong to *rebūtum* 9-7. Line 4, *qà-ab-li-tim* in the genitive implies that it is preceded by *titur* meaning 'bridge'. The intervals could either be 4-8, or 11-9. In line 5 *išartim* could be preceded by *titur* since it is in the genitive, interval 12-10. Line 7 has *išartum* in the nominative, interval 2-6. Line 8 ending with a genitive could either be titur *qablītim* or *titur išartim*, 11-9 or 12-10. The next line, 9 with -*d*]*i-im* could either be 1-5, 4-8 or 11-9. Line 10 with its nominative ending is most likely to be 6-9.

1 Woolley, C.L., *Ur Excavations*, Volumes I and II, (opere citato).

string	5?	= D?
interval	5-9	b-c-d-e-f
interval	11-9	g-a-b
interval	9-7	b-c-d
interval	2-6	e-f-g-a-b
string	1 of rear	= G
interval	2-6	e-f-g-a-b
interval	8-6	c-d-e
interval	6-4	e f g
interval	6-10	a-b-c-d-e
string	4 of rear	= C
interval	6-10	

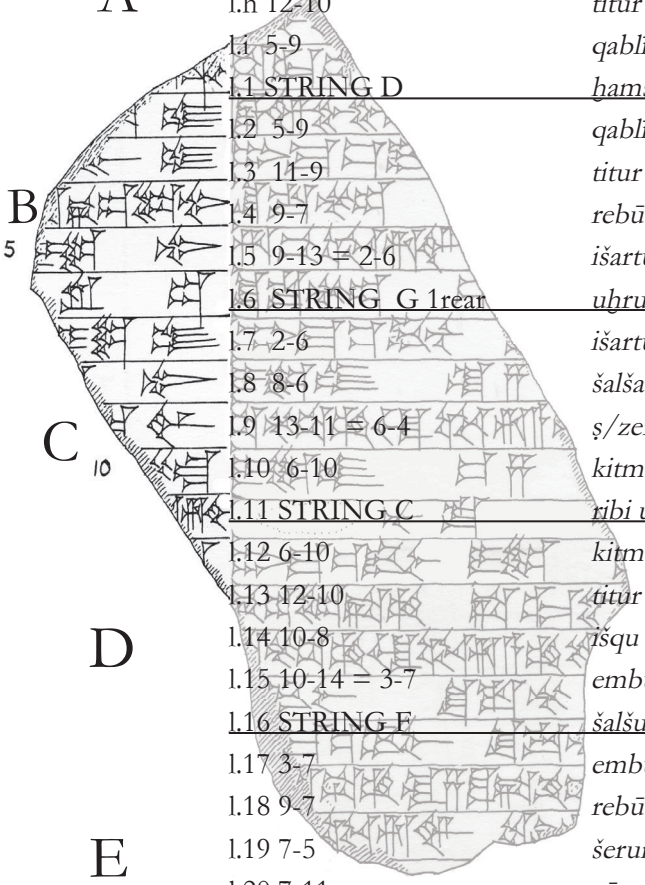
Figure 7, U.7/80, interpretation of string and interval positions.

Leaving aside the philological problems raised by the above reconstruction and relying only on musicological logic, we note that the text is made up of quatrains, as is the case with the right column of the same tablet. However, on this column, quatrains are subtitled with pitch-string names arranged in descending fifths, according to our reconstruction.

The quatrain proceed as follows:

1) The first line is a descending melodic fifth.
2) The second line is an ascending melodic third.
3) The third line is an ascending melodic third.
4) The fourth line is a descending melodic fifth.
5) The fifth line is the name/pitch of a string.

These intervals follow a specific pattern: 1-5; 7-5; 12-10; 5-9. These represent intervals which are written in full as they are listed in the generative system: 1-5 = *niš tuḫrim*; 7-5 = *šerum*; 12-10 = *titur išartim*; 5-9 = *qablītum*. Follows the subtitle, in this case: *ḫamšu* ? The next quatrain starts with the last interval ending the previous one. In this case: 5-9, interval *qablītum*. See figure 8 next page for full reconstruction.



l.e STRING A	*qudmu*	String A
l.f 1-5	*niš tuḫrim*	f-c-a-b-c
l.g 7-5	*šerum*	d-e-f
l.h 12-10	*titur išartim*	f-g-a
l.i 5-9	*qablītum*	b-c-d-e-f
l.1 STRING D	*ḫamšu*	String D
l.2 5-9	*qablītum*	b-c-d-e-f
l.3 11-9	*titur qablītim*	g-a-b
l.4 9-7	*rebūtum*	b-c-d
l.5 9-13 = 2-6	*išartum*	e-f-g-a-b
l.6 STRING G 1rear	*uḫrum*	String G
l.7 2-6	*išartum*	e-f-g-a-b
l.8 8-6	*šalšatum*	c-d-e
l.9 13-11 = 6-4	*ṣ/zerdum*	e-f-g
l.10 6-10	*kitmum*	a-b-c-d-e
l.11 STRING C	*ribi uḫrim*	String C
l.12 6-10	*kitmum*	a-b-c-d-e
l.13 12-10	*titur išartim*	f-g-a
l.14 10-8	*išqu*	a-b-c
l.15 10-14 = 3-7	*embūbum*	d-e-f-g-a
l.16 STRING F	*šalšu qatnu*	String F
l.17 3-7	*embūbum*	d-e-f-g-a
l.18 9-7	*rebūtum*	b-c-d
l.19 7-5	*šerum*	d-e-f
l.20 7-11	*pītum*	g-a-b-c-d
l.21 STRING B	*šalši uḫrim*	String B
l.22 7-11	*pītum*	g-a-b-c-d
l.23 13-11	*serdû*	e-f-g
l.24 11-9	*titur qablītum*	g-a-b
l.25 4-8	*nīd qablim*	c-d-e-f-g
l.26 STRING E	A-DÙ	String E
l.a 4-8	*nīd qablim*	c-d-e-f-g
l.b 10-8 = 3-1	*isqum*	a-b-c
l.c 8-6	*šalšatum*	c-d-e
l.d 8-12 = 1-5	*niš tuḫrim*	f-c-a-b-c
l.e STRING A	*qudmu*	String A

Figure 8. Reconstruction of the left column of U.7/80 with intervals and polarities indicated by arrows.

Structural analysis of the system in the left column

As shown in figure 8, the system is made up of seven quatrains. We assume that the series started with quatrain 'A' for the reason that it starts with the interval 1-5 = *niš tuḫrim*, followed immediately by *šerum*, as we have it in CBS 10996. It is followed by titur *išartim* and *qablītum*. This generates the following pattern:

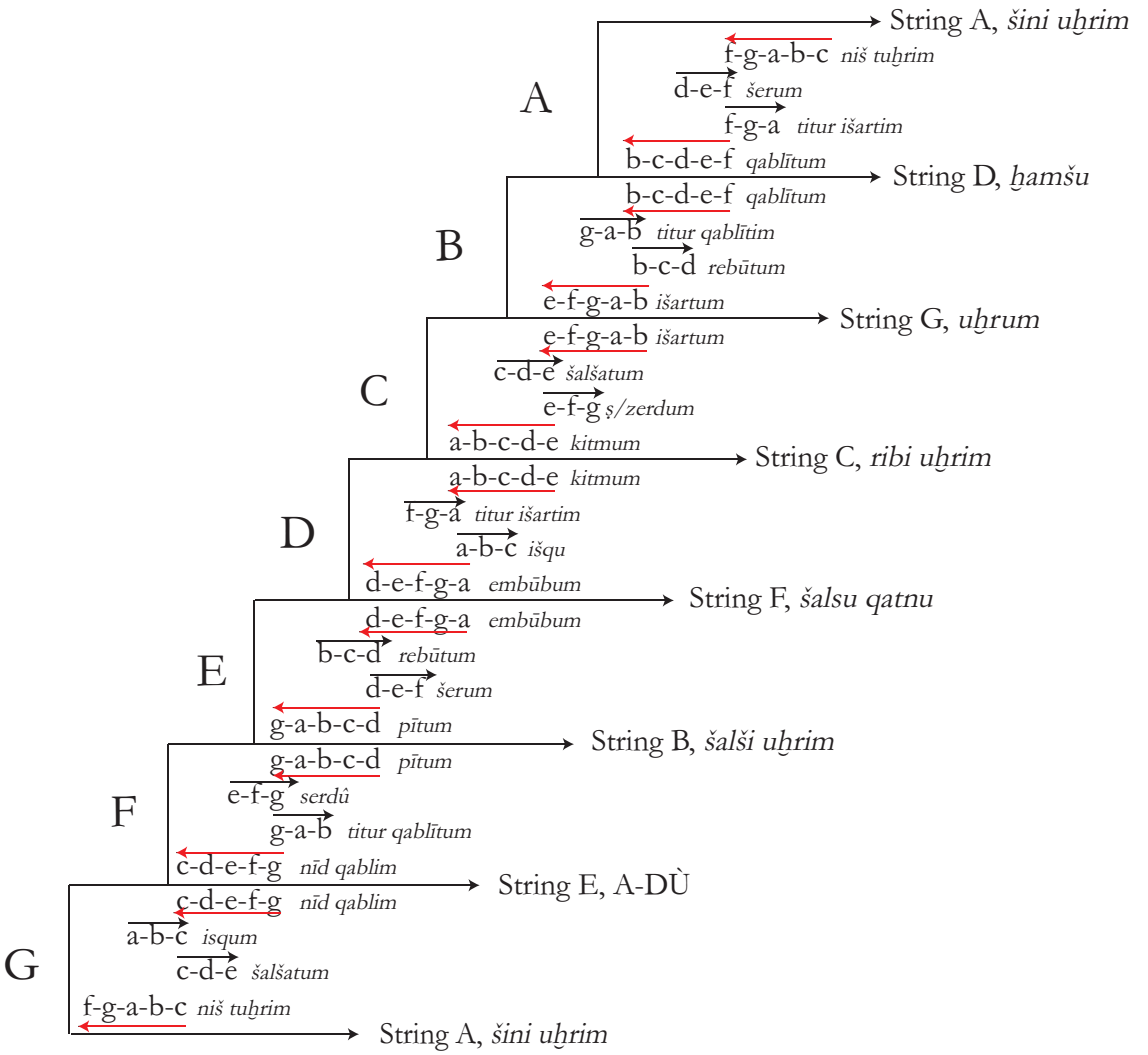


Figure 9. Reconstruction of the left column of U.7/80 with intervals values and polarities indicated by arrows.

Observation

In our reconstruction,

1) The first quatrain, 'A',

a) Starts with the descending melodic fifth *niš tuḫrim*.
b) It is complemented with the last member of the quatrain, the descending melodic fifth *qablītum*.
c) The conjoining of the two intervals amounts to the set *išartum*.
niš tuḫrim + *qablītum* = *išartum*. (c-b-a-g-f + f-e-d-c-b = c-b-a-g-f-e-d-c-b)
d) The next quatrain starts with the descending melodic fifth *qablītum*.
e) The two inner ascending melodic intervals of the first quatrain are *šerum* and *titur išartim*.
f) When they are conjoined as a-g-f-e-d they form the melodic fifth *embūbum* which ends on 'd' which is the pitch of string *ḫamšu*.

2) The second quatrain, 'B',

a) Starts with the descending melodic fifth *qablītum*.
b) It is complemented with the last member of the quatrain, the descending melodic fifth *išartum*.
c) The conjoining of these intervals amount to the set *qablītum*.
qablītum + *išartum* = *qablītum*. (f-e-d-c-b + b-a-g-f-e = f-e-d-c-b-a-g-f-e).
d) The next quatrain starts with the descending melodic fifth *išartum*.
e) The two inner melodic intervals of the second quatrain are *titur qablītum* and *rebūtum*.
f) When they are conjoined (d-c-b-a-g) they form the descending melodic fifth *pītum* which ends on 'g' which is the pitch of string *uḫrum*.

The next quatrains follow the same pattern. The last descending melodic fifth of the last quatrain is also the first descending melodic fifth of the first quatrain. Therefore, this system consisted of a series of seven melodic enneatonic sets.

Analysis

From the above observations, we can lay the following rules:

I The first and fourth descending fifths of a quatrain conjoin into a set. (This subset is also - significantly - the first one cited in the first quatrain of the right column of U.7/80).

II The last descending fifth of a quatrain is taken as the first descending fifth of the quatrain which follows.

III The two inner ascending melodic thirds amount to a descending fifth the last pitch of which being the name of the string listed after each quatrain.

Conclusion

We do not see any purpose for this series of quatrains other than they appear to be a form of classification. However, it confirms that descending melodic enneads are made of conjoined descending melodic fifths. Descending melodic fifths are made of conjoined ascending melodic thirds.

N 4782

(Fragment of *nabnītu* xxxii)

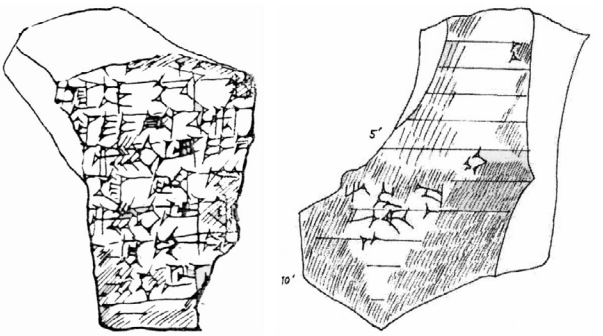


Figure 1. Hand copies of N 4782, left, Rev. by Shaffer, right, Obv. by Miguel Civil

In November 1977 Aaron Shaffer found a small fragment in the University Museum collection in Philadelphia, which he believed complemented UET VII 126. It was published in 1981(fig.14).

Obverse

Line	Sumerian column	Akkadian column
1’ (i8)	[x x x x]	*š[i]-n[i] ú[ḫ-re-em]*
2’ (i9)	[x x x x]-la	*úḫ-ru-[um]*
3’ (i12)	[x x]-sa 2	*i-ša-ar-[tum]*
4’ (i13)	[x x x x x]	*sí-ḫi-ip i-š[a-ar-ti-im]*
5’ (i14)	[x x x x x]	*ki-it-mu-[um]*
6’ (i15)	[x x x x x]	*sí-ḫi-ip ki-i[t-mi-im]*
7’ (i16)	[x x x x x]	*en-bu-bu-[um]*
8’ (i17)	[x x x x x	*s]í-ḫ-ip e[n-bu-bi-im]*

Reverse

Line	Sumerian column	Akkadian column
1’- 4’ broken or undeciphered traces		
5’	[x x x x	*x x x] a [xx]*
6’	[x x x x	*x x x x] ḫi-x [x]*
7’	[x x x x x	x x x x x]
8’	[x x giš al]-gar	x x[x x x]
9’	[x x x	*x]x ti-x-[x x x]*
10’	[x x x x]x	*[x x x x x]*
rest broken		

UET VII 126, Obv. Col.I & 2, N.B. + N 4782, Obv. O.B.?

1.	**sa.di**	*qud-mu-u*[*um*]	[**sa.di**	*qud-mu-u-um*]
2.	**sa-uš**	*šá-mu-šu-um*	[**sa.uš**	*šá-mu-šu-um*]
3.	**sa.3.sa.sig**	*ša-al-šu qa-a*[*t-nu*]	[**sa.3.sa.sig**	*ša-al-šu qa-at-nu*]
4.	**sa.4.tur**	*a-ba-nu-*[*ú*]	[**sa.4.tur**	*a-ba-nu-ú*]
5.	**sa.di*5**	*ḫa-am-*[*šu*]	[**sa.di*5**	*ḫa-am-šu*]
6.	**sa.4.a.ga.gul**	*ri-bi úḫ-ri-i*[*m*]	[**sa.4.a.ga.gul**	*ri-bi úḫ-ri-im*]
7.	**sa.3.a.ga.gul**	*šal-ši úḫ-ri-rim*	[**sa.3.a.ga.gul**	*šal-ši úḫ-ri-rim*]
8.	**sa.2.a.ga.gul**	*ši-ni úḫ-ri-im*	1’ [**sa.2.a.ga.gul**]	*ši-ni ú*[*ḫ-ri-im*]
9.	[**sa.1**]**a.ga.gul.la**	*úḫ-ru-um*	2’ [**sa.1**.]**a.ga.gul**].**la**	*úḫ-ru-um*
10.	[**9**]**sa.a**	9 *pi-it-nu*		
11.	[**sa.**]**du.a**!	*pi-is-mu*		
12.	[**sa.**] **si.s**]**á**	*i-šar-ti*	3’ [**sa.si**].**sá**	*i-ša-ar-*[*tum*]
13.	[**sa.x si.sá**]	[*s*]*i-ḫ-ip i-šar-tum*	4’ [**sa.x sa.s**]**á**	*si-ḫi-ip i-š*[*a-ar-tim*]
14.	[**sa. šu**?]	[*ki-i*]*t-mu*	5’ [**sa.š**]**u**?	*ki-it-mu-*[*um*]
15.	[**sa.x šu**?]	[*si-ḫi-ip k*]*i-it-mu*	6’ [**sa.x š**]**ú**?	*si-ḫi-ip ki-*[*it-mi-im*]
16.	[**sa.gi.gíd**]	[*em-bu-bu*]*-um*	7’ [**sa.gi.g**]**íd**	*em-bu-bu-*[*um*]
17.	[**sa.x.gi.gíd**]	[*si-ḫi-ip em-bu-bu-u*]*m*	8’ [**sa.x.gi.gíd**]	*si-ḫi-ip e*[*n-bu-bi-im*]
18.	[**sa.x**]	[*pi-tum*]	9’ [**sa.x**]	[*p*]*i-*[*tum*]
19.	[**sa.x y**]	[*siḫip pitim*]	10’ [**sa.x y**]	[*siḫip pitim*]
20.	[**sa.šub.murub$_4$**]	[*nīd qablim*]	11’ [**sa.šub.murub$_4$**]	[*nīd qablim*]
21.	[**sa.x.šub.murub$_4$**]	[*siḫip nid qablim*]	12’ [**sa.x.šub.murub$_4$**]	[*siḫip nīd qablim*]
22.	[**sa.x.gaba.ri**]	[*niš tuḫrim*]	13’ [**sa.x.y.gaba.ri**]	[*nīš tuḫrim*]
23.	[**sa.x.y.gaba.ri**]	[*siḫip niš tuḫrim*]	14’ [**sa.x.y.gaba.ri**]	[*siḫip nīš tuḫrim*]
24.	[**sa.x.murub$_4$**]	[*qablitum*]	15’ [**sa.x.murub$_4$**]	[*qablitum*]
25.	[**sa.x.y.murub$_4$**]	[*siḫip qablitum*]	16’ [**sa.x.y.murub$_4$**]	[*siḫip qablitim*]

N 4782 is certainly a fragment which is the continuation of *nabnītu* xxxii, from another copy of the text. It would be a second ‘chapter’, as after having listed the nine string-pitches of the system, the text continues with line 11. [**sa.**]**du.a**! (Sumerian) *pi-is-mu* (Akkadian), as a header. But what is the meaning of *pismu*? The *CAD* is inconclusive as it says nothing more than we already know. An enlightened guess, on the basis of our interpretation of lines 12 (= 3’), to 25 (=16’) is that *pismu* would be the term for ‘melodic fifth’, and that with regard *siḫip*, *siḫpum* would be a nominal derivative of *saḫapum*, ‘to throw to the ground’. However, for reasons that will become obvious during the process of our explanations, we would translate the verb *saḫapum* not as ‘to throw to the ground’, but ‘to sub-place’ the designated melodic fifth at the beginning of the next subset. As we explained before, an enneatonic set is made up of two conjoined melodic fifths and we believe that lines 12 (= 3’), to 25 (=16’) give firstly the name of the second fifth of a set, and secondly the instruction (*siḫip*) to replace it at the beginning of the next set where it is followed by a second fifth, thus creating a new set, and so forth. Therefore these lines explain the formation of enneatonic sets and confirm that each is made up of two conjoined melodic fifths.

Before explaining the process, let us be reminded of the structure of the sets:

Fifths *nīš tuḫrim* + *qablītum*	=	subset of *išartum*	= c-b-a-g-f-e-d-c-b
Fifths *qablītum* + *išartum*	=	subset of *qablītum*	= f-e-d-c-b-a-g-f-e
Fifths *išartum* + *kitmum*	=	subset of *nīš tuḫrim*	= b-a-g-f-e-d-c-b-a
Fifths *kitmum* +*embūbum*	=	subset of *nīd qablim*	= e-d-c-b-a-g-f-e-d
Fifths *embūbum* + *pītum*	=	subset of *pītum*	= a-g-f-e-d-c-b-a-g
Fifths *pītum* + *nīd qablim*	=	subset of *embūbum*	= d-c-b-a-g-f-e-d-c
Fifths *nīd qablim* + *nīš tuḫrim*	=	subset of *kitmum*	= g-f-e-d-c-b-a-g-f

and lines 3' to 16' of N 4782:

Line.12	*išartum*
Line.13	*siḫip išartim*
Line.14	*kitmum*
Line.15	*siḫip kitmim*
Line.16	*embūbum*
Line.17	*siḫip embūbim*
Line.18	*pitum*
Line.19	*siḫip pitim*
Line. 20	*nīd qablim*
Line. 21	*siḫip nīd qablim*
Line. 22	*nīš tuḫrim*
Line. 23	*siḫip nīš tuḫrim*
Line. 24	*qablītum*
Line. 25	*siḫip qablītim*

Explanation of the process from lines 3 to 16 of N 4782:

išartum (fifth)	f-e-d-c-**b-a-g-f-e**	(set of *qablītum*)
siḫip išartim (move *išartum* to the front)	**b-a-g-f-e**-d-c-g-a	(set of *nīš tuḫrim*)
kitmum (fifth)	b-a-g-f-**e-d-c-g-a**	(set of *nīš tuḫrim*)
siḫip kitmim (move *kitmum* to the front)	**e-d-c-g-a**-g-f-e-d	(set of *nīd qablim*)
embūbum (fifth)	e-d-c-g-**a-g-f-e-d**	(set of *nīd qablim*)
siḫip embūbim (move *embūbum* to the front)	**a-g-f-e-d**-c-b-a-g	(set of *pitum*)
pitum (fifth)	a-g-f-e-**d-c-b-a-g**	(set of *pitum*)
siḫip pitim (move *pitum* to the front)	**d-c-b-a-g**-f-e-d-c	(set of *embūbum*)
nīd qablim (fifth)	d-c-b-a-**g-f-e-d-c**	(set of *embūbum*)
siḫip nīd qablim (move *nīd qablim* to the front)	**g-f-e-d-c**-b-a-g-f	(set of *kitmum*)
nīš tuḫrim (fifth)	g-f-e-d-**c-b-a-g-f**	(set of *kitmum*)
siḫip nīš tuḫrim (move *nīš tuḫrim* to the front)	**c-b-a-g-f**-e-d-c-b	(set of *išartum*)
qablītum (fifth)	c-b-a-g-**f-e-d-c-b**	(set of *išartum*)
siḫip qablītim (move *qablītum* to the front)	**f-e-d-c-b**-a-g-f-e	(set of *qablītum*)

The table above explains the instructions in lines 3 to 16. The term *siḫip* unequivocally indicates the shift of the second fifth of a set to the position (in red above) of the first fifth in the next set, and so forth. This further proves that the sets are made up of two conjoined fifths amounting to an enneatonic set. It is also proposed that the term '*pismu*' means 'melodic fifth', to distinguish it from the enneatonic set of the same name.

CBS 1766
First evidence of heptatonism

Figure 1. CBS1766, courtesy of the University Museum of Philadelphia, Pennsylvania.

This text is kept in the collections of the University Museum, Philadelphia, Pennsylvania. It was first published by Hilprecht over one hundred years ago in his *Explorations in Bible Lands During the 19th Century*[1]. The volume includes a photograph with a caption describing the manuscript as an 'Astronomical Tablet from the Temple Library'.

Caroline Waerzeggers and Ronny Siebes[2] from the Vrije Universiteit in Amsterdam offered a reliable reading of most of the text, especially with regard the nomenclature on the heptagon, which they identified as musical terms.

The tablet is divided into two sections. The first section, (fig. 2) at the top left consists of a heptagram inscribed within two concentric circles with script written on the inner side of the circles.

The second section, below the heptagram, is a table with 11 columns the first of which empty, with traces of script. Columns two and three are inscribed with two lists of seven numbers each (possibly eight). These columns are essential to the principal meaning of the text. A header

1 Hilprecht, H. V. (Hermann Vollrat), 1859-1925; Benzinger, I. (Immanuel), 1865-1935; Hommel, Fritz, 1854-1936; Jensen, Peter Christian Albrecht, 1861-1936; Steindorff, Georg, 1861-1951. *Explorations in Bible lands during the 19th century*. (1903).

2 *N.A.B.U.*, (2007), no. 2 (juin), pp. 43-5.

spreads along the whole length of the columns. Some propositions have been put forward regarding its interpretation but none up to now is sufficiently intelligible. Column 11 has traces of terms which remain obscure.

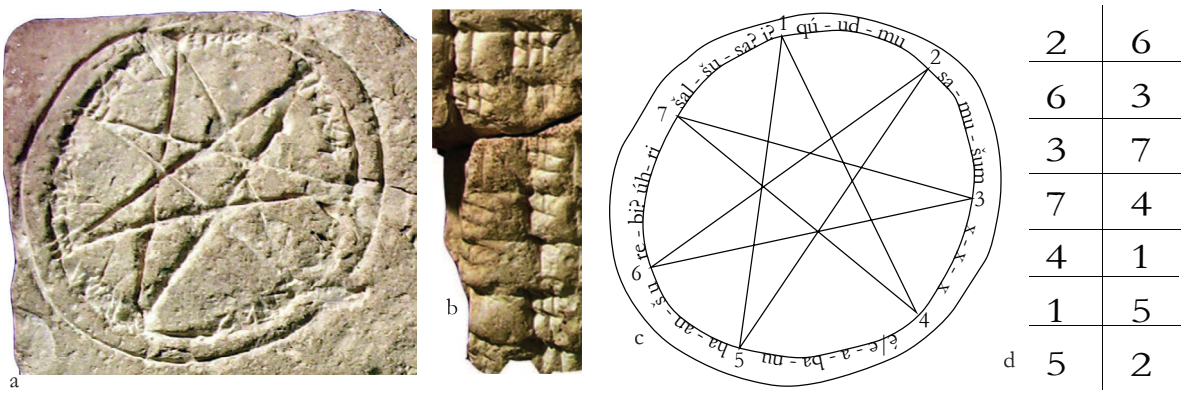


Figure 2, a, b, c and d. a) detail of the heptagram in the tablet; b) detail of the columns with the numbers related to the heptagram; c) line copy of the heptagram and transliteration; d) transcription of the numbers in the columns related to the heptagram.

The nomenclature on the heptagram and the readings of the first two columns to the left of the table are clear, as shown in figure 2, c.

The numbers in the columns express an alternation of descending fifths and ascending fourths. If '1' is 'C', then '2-6' = 'B-E'; then '6-3' = 'E-A'; '3-7'= 'A-D'; '7-4'= 'D-G'; '4-1' ='G-C'; '1-5'= 'C-F' and '5-2'= 'F-B'.

To a musicologist, this pattern suggests immediately a typical method of tuning, still in usage to this day, for the construction of a heptatonic scale by means of descending fifths and ascending fourths. The reason we have chosen to start the pattern with descending fifth 'B-E' followed by ascending fourth 'E-A', etc., is that the last alternation will fall on a tritone, avoiding any sharps or flats, for the sake of clarity. The heptagram associates the points of the star with the names of the strings from one to seven. It is to be noted that although the strings have been reduced to seven out of nine, as with most other texts, the remaining seven have kept the older nomenclature, i.e., 'front (string)'; 'neighbouring (string)'; 'third thin (string)' 'Ea-the-creator'; 'fourth-behind' and 'third-behind'. It makes no doubt that while the heptagram was a systemic revolution, it nevertheless kept elements of the older style. They could have named the strings first-string; second string; third string; fourth string; fifths string and seventh string, following the order of the numbers.

Unfortunately, this text is incomplete. However, its readable parts are sufficiently explicit to prove heptatonism, its construction and the first evidence of cyclical pitch dispersion. The columns could be reconstructed. However, their content does not appear to give anything particular other than natural properties of the heptachord. We could assume that the header simply explained the figures in the columns, in which case, its importance would not be of great consequence. However, this is speculative.

More importantly is the reason why the heptagram is drawn so carelessly? While it is agreed that a heptagram cannot be drawn *exactly* with ordinary drawing tools, we must agree that the scribe could have done better. Then, an inspired amateur offered a most interesting remark without really understanding its importance. She assumed that the irregularity was intentional because it was the first ever attempt at representing semitonal values, *graphically*. Indeed, a regular heptagon falsely expresses heptatonism since the points of the star are equidistant. A closer look at the design explains her position.

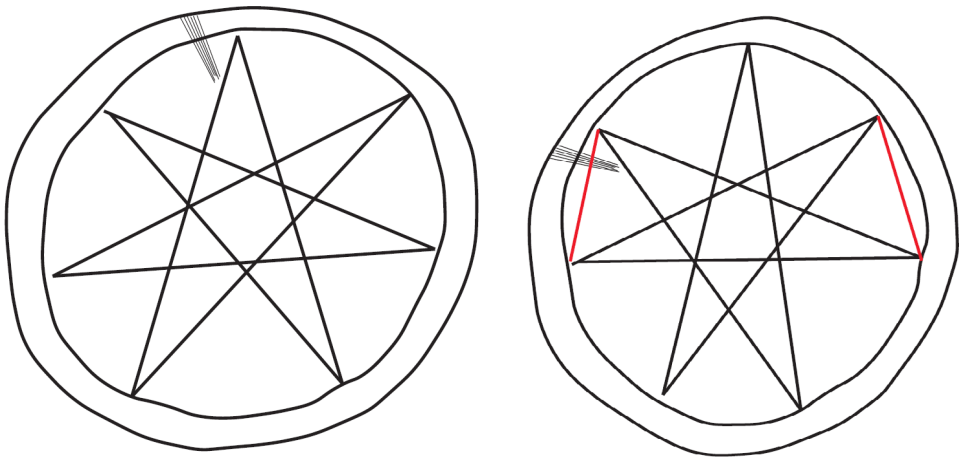


Figure 3. Left, heptagram as it is orientated in the original text. Right, heptagram rotated to locate semitones in symmetry, at both sides, delineated with red lines.

Figure 3, left, shows the heptagram in its original position in relation to the tablet. Figure 3, to the right, shows the heptagram rotated counter-clockwise by about 40 degrees. Immediately the answer appears: The red lines locate the semitones in the heptatonic representation. There, they are placed *symmetrically* in relation to the vertical point 2, which in our hypothesis is pitch B which starts the sequence of alternation of descending fifth and ascending fourths, as given in the columns in figure 2, b and d.

The striations to the left of point 1 appear to emphasize the location of c.

Additionally to giving instructions for the construction of a heptatonic set, the figure was probably used as a device (build from two round plates of metal rotating, on top of one another) which located tones and semitones in each of its seven subsets. For example, in the subset of *qudmû*, the semitones are located between the first and second strings and the fifth and sixth strings; in the subset of *šamušum*, the semitones are between fifth and sixth strings and first and second strings, and so forth.

As soon as Babylonian scholars estimated the semitone as half a tone, it would have become far easier for them, conceptually, to divide the 360 degrees of the circle into 12 sections of 30 degrees since the theory approximately divided the octave into six tones, or twelve semitones[3].

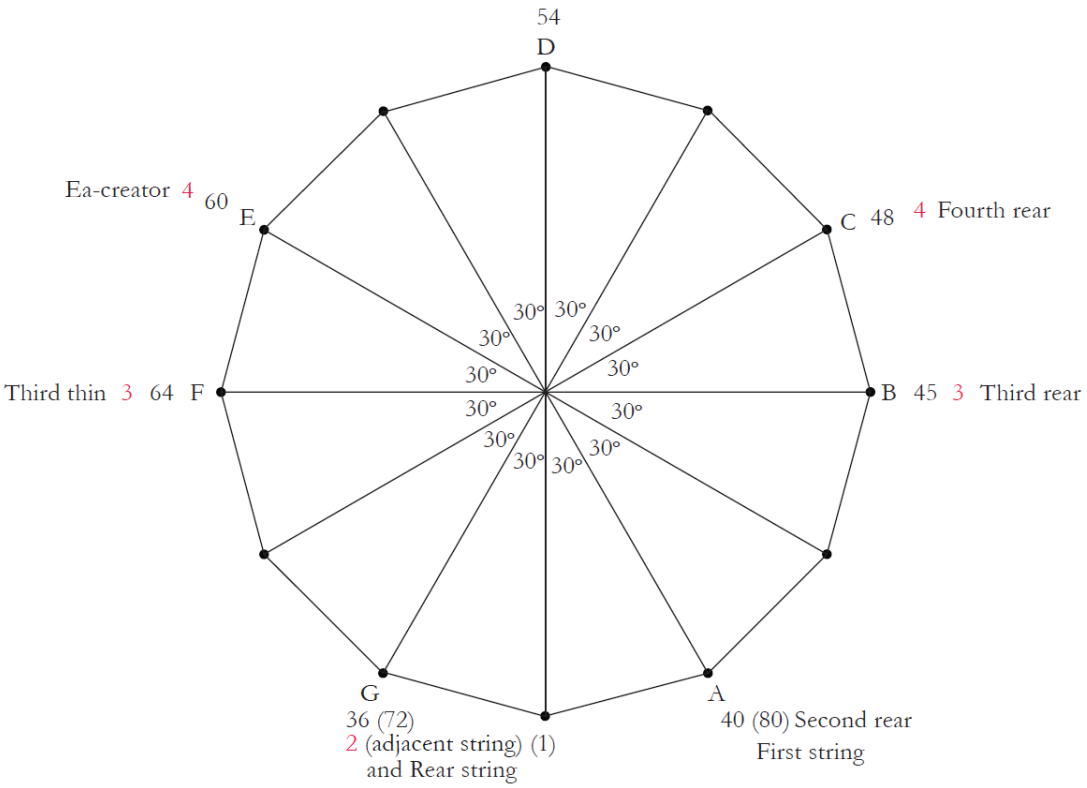


Figure 4. Dodecagram placing the enneachord in red numbers;
Nippur quantification of 30 degrees per semitone and 60 per tone.

While Babylonian scholarship might have divided the circle into twelve angles of 30 degrees to quantify semitones; two semitones of 60 degrees for tones, and consequently would have invented the equal temperament system is far-fetched. In case they did actually invent the equal temperament, they could not have applied it as it rests on the slight reduction of fifths and slight expansion of fourths with thirds increasing their numbers of interferential beats as they progress to the treble. Firstly this method would have been beyond their reach and secondly they would have had no purpose for it as equal temperament is useful only with the concept of Western harmony.

Among other hypothetical inventions was their calculation of frequency. However, this was only in the form of reciprocals of strings lengths and in ignorance of what frequency was; they invented chromaticism but only as a consequence of the metabolisation of the dynamic to the

3 However, six just tones are larger than an octave as 6 x 9/8 = 531441/262144 which is 1223.46 cents, or 23.5 cents larger than the octave. So the division of the 360 degrees of the circle into 12 parts of 30 degrees each, was only applicable for music theory not until Napier's invention of logarithms which led to Juan Caramuel y Lobkowitz's contribution to the equal temperament, in the mid-seventeenth century. This was possibly the source for Aristoxenos' early discussions on this matter in the fourth century BC. (Fig. 4)

thetic, but which they never used it as Western Musicology understands it; they came up with heptatonism in the late first millennium but only as a subsystem of enneatonism.

The irregular seven-pointed star also changed the morphology of the heptatonic set. Enneatonism consisted in the conjoining of two melodic fifths while the heptatonic set consisted of two conjoined harmonic fourths.

In order to understand the metabolisation of the enneatonic set to the heptatonic set, or the metabolisation from linear to cyclical pitch dispersion, just imagine that the series in *nabnītu* xxxii, 1-2-3-4-5-4-3-2-1 is a series of pitches marked by knots on a string (figure 5):

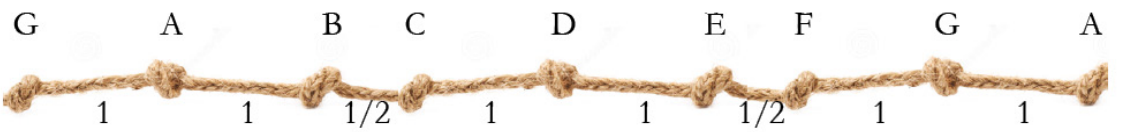


Figure 5. Enneatonic generative set in a linear pitch dispersion with 'D' as axis of symmetry. Tones and semitones are labelled '1' and '1/2' respecticely.

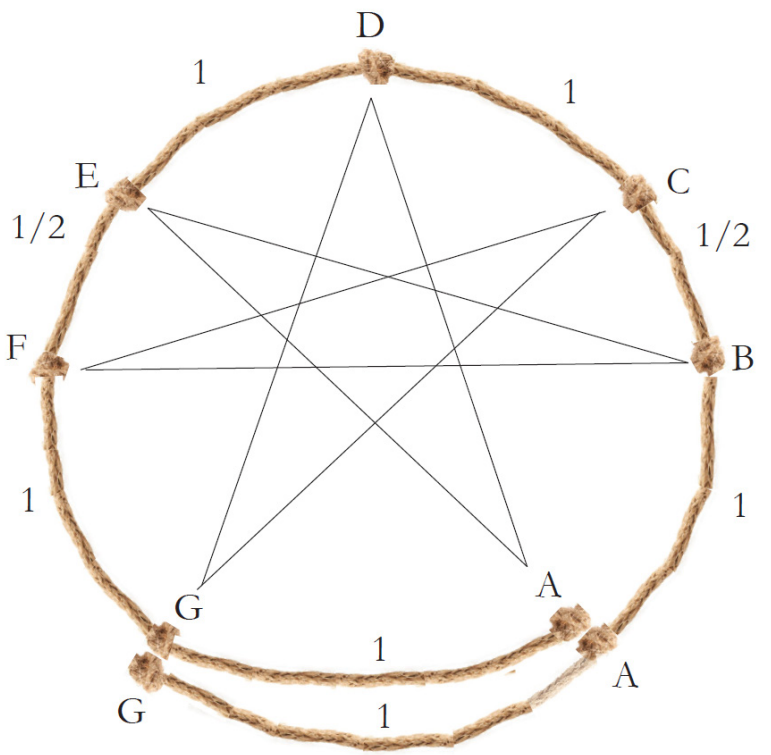


Figure 6. The 'enneatonic' rope is rolled over the heptagram. note the doubling of 'As' and 'Gs' resulting in the change from enneatonic to heptatonic systems. This explains the metabolisation from linear to cyclical pitch dispersion.

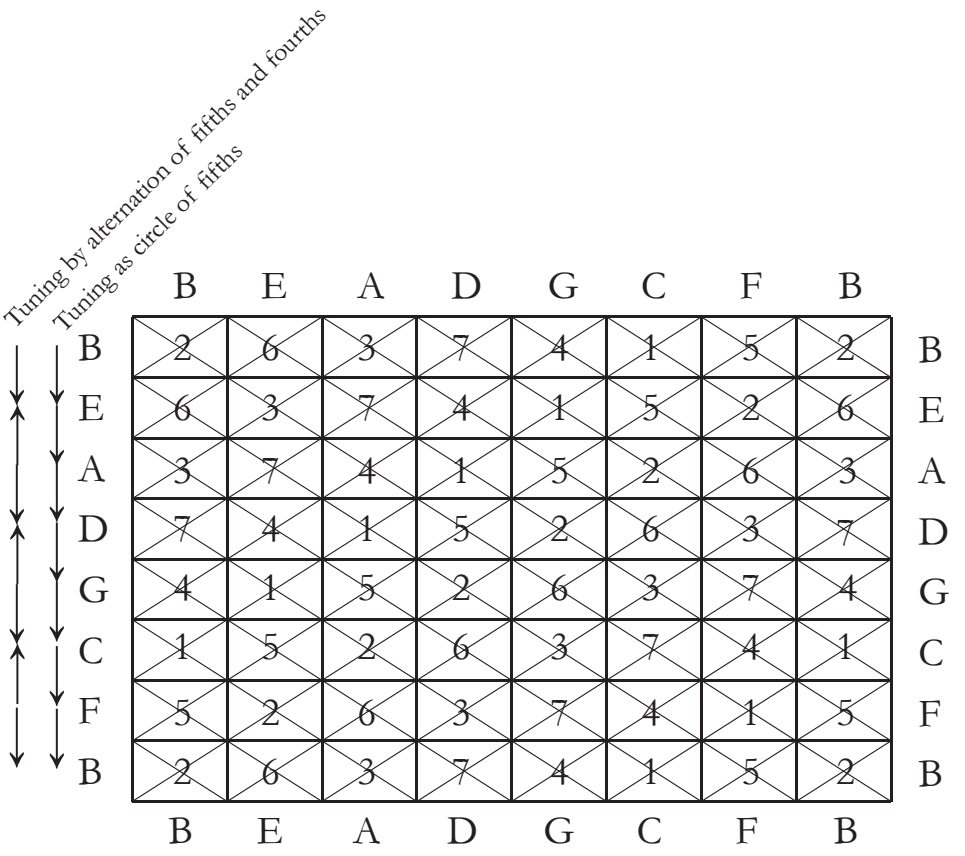


Figure 7. Reconstruction of the numbers in the tables of the texts.

YBC 11381

In 2010, Elizabeth E. Payne[1] published the latest cuneiform text with musical terms. It is Neo-Babylonian and is kept in the Yale Babylonian Collection. It is certainly one of the most significant additions to the corpus of music theory for the past fifty years. Our interest in this text rests with its musicology. Therefore, we shall rely on Payne's transliteration and translation (fig. 1).

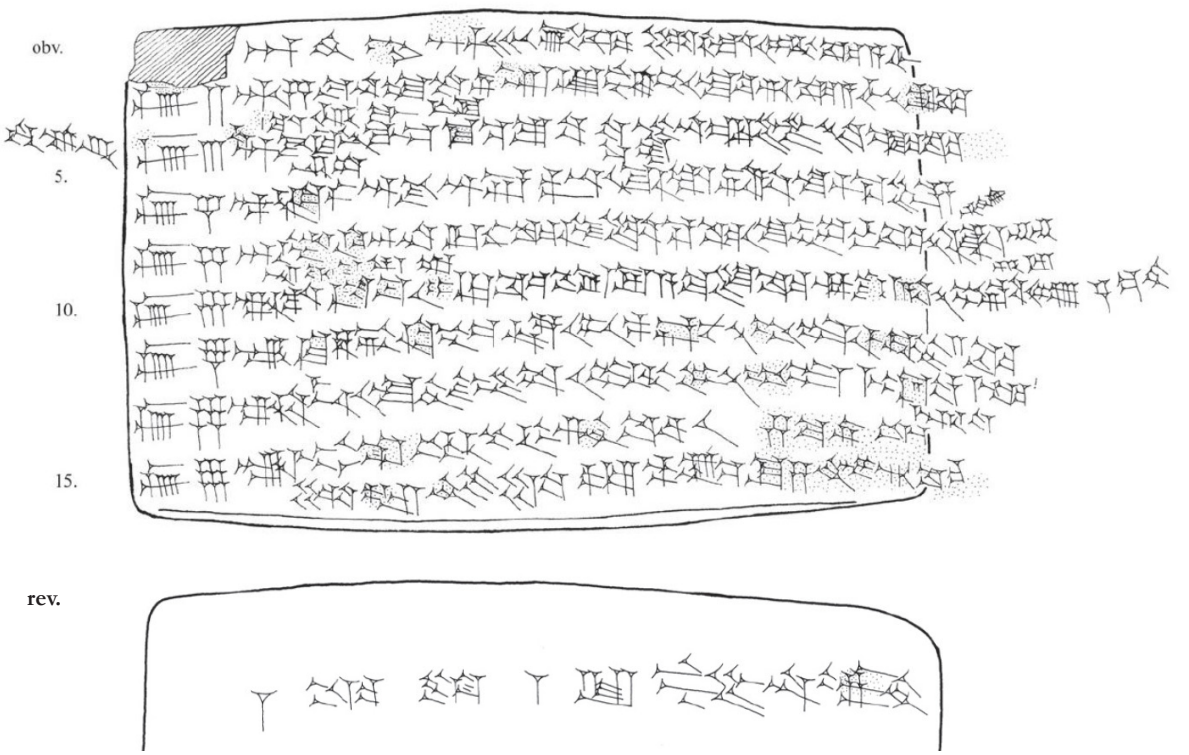


Figure 1. Payne's Hand copy of YBC 11381, rev. (5.8 x 8.9 x 2.5 cm)

1 Payne, E.E., 'A new Addition to the Musical Corpus' in *Opening the Tablet Box, Near Eastern Studies in Honor of Benjamin R. Foster*. Sarah C. Melville and Alice L. Slotsky, eds. *Culture and History of the Ancient Near East*. VOLUME 42, Brill, (Leiden, Boston, 2010), pp. 291-300.

Obv. [sa] ⌜an⌝.šár ⌜lugal dingir⌝ ^{meš}*be-lut-ka li-dam-mi-iq ka-a-ši*
⌜sa⌝ 2 ^{d} 15 *ba-na-at te-*⌜*né-šit*⌝ *ṭu-ub lib-bi u la-ba-ri ka-as-ši liš-*⌜*ruk*⌝*-ka*
sig *da-ar!-gal kak-ku*
sa 3 ^{d}dàra.gal ^{giš}tukul *ez-zu-tú* u_4*-mu na-al-bu-bu liš-tam-ḫir-ka* [(x)]
5 en du *qa-at*
sa 4 ^{d}en!⌜ki⌝. dù ^{d}gašan ^{d}lamma *pa-ti-qat dam-qá-a-tú la-mas-si bu-un-*(*ni*)
gi-ir
sa 5 ^{d}⌜dam.ki⌝.an.na *tés-lit-ka ṣu-le-e-ka u la-ban ap-pi-ka liš-tam-gir ana* en.en
en-⌜da-šu⌝*-ru-um* ri-ib
10 sa 6 ^{d}en.da.⌜šurim.ma *mi*⌝*-lik-ka nak-lu a-ma-tu-ka aq-*⌜*ra*⌝*-a-tú liš-taq-rib*
u_4*-mi-šam šá-am*
sa 7 ^{d}en.du_6.kù.ga ⌜*ki*⌝*-bi-is šul-mi u pa-*⌜*dan*⌝*-nu liš-tak-kan ana ši-*⌜*kin*⌝*gir*^{ll}*-ka* ME
sa 8 ^{d}en.u_4.ti.la *ḫi-ṣib ṭuḫ-du u* ḫé.gál-lu_4 *liš-tak-kan ana me-* ⌜*rit*⌝ *érin*^{me}*-ka* !
me-ri-tú
15 sa 9 ^{d}en.me.šàr.⌜ra⌝*il-lat rag-*⌜*gi*⌝*-ka u* ⌜*za-ma-ni-ka*⌝
li-šab-bir li-sap-pi-iḫ ^{giš}⌜tukul *za-'-i-ri*⌝*-ka*

rev. *ana* ka sar *ana ṭu-ub-bi na-*⌜*as*⌝*-ḫi*
le.e. *šal-šú uḫ-ri*

String 1 may **Aššur**, the king of the gods, improve your dominion for you.
String 2 may **Ištar**, who created mankind, grant you well-being and longevity.
String 3 may **Daragal** make you rival the fierce weapon(s and) the raging storm.
String 4 may **Enkidu**, treat kindly the Lady, the protective spirit who created good things, the lamassu.
String 5 may **Damkianna** make your appeal, your prayers, and the stroke of your nose always pleasing to the lord of lords.
String 6 may **Endašurimma** present your artful advice and your precious words daily.
String 7 may **Endukuga** always let your footstep fall on a prosperous road and a smooth path. (Gloss)
String 8 may **Enudtila** constantly establish abundance, plenty, and prosperity for the pastures of your people.
String 9 may **Enmešarra** crush the forces of those who wrong you and of your enemies. May he scatter the weapons of your adversaries.

Copied according to dictation; excerpted for (my) well-being. (left edge) The third (string) from the end.

We take it that each line with its own string and its own incipit might have indicated that the melody the incipit of which is inscribed, was sung in the set which starts with the string/pitch with which the line starts and accordingly to the corresponding pitch listed in U.3011, and to the set given with U.7/80. Therefore, for the first string, the set would be: a-g-f-e-d-c-b-a-g, in dynamic, and c♯-b-a-g♯-f♯-e-d♯-c♯-b, in the thetic, which is the set of *pītum*, appropriately meaning 'opening'. The melody in the second line would start by the second pitch in U.3011, etc.

However, it might have indicated that it was the string, alone, and not a melody that was meant for the dedicatee god, but this would have disregarded the reason for including an incipit since it is there to remind of a specific melody most probably sung in a specific set.

Therefore, there must be a relationship between, a) the string, b) the dedicatee god, c) the melody of the incipit, and d), the nature of the set.

However, it is not clear if the strings listed in YBC 11381 follow the order in U.3011 which would be the most logical assumption because U.3011 lists nine string/pitches while, according to Gurney's reconstruction of U.7/80, the sets are limited to eight, the eighth being about a semitone higher that the first set, and therefore not at its octave. We could further assume that the ninth set would too be about a semitone higher than the second set.

A two thousand years-old enneatonic tradition was still well engraved in the minds of musicians and of the composers of melodies, as this text attests. We note that the fourth string, 'Ea-the-creator' in Nabnitu xxxii is still known here as '**sa** 4 - Enkidu...'.

The text leaves an unexplained reverse: *ana* ka sar *ana ṭu-ub-bi na-*⌜*as*⌝*-ḫi*

le.e. *šal-šú uḫ-ri*

H6 = (RŠ13.30 + 15.49 + 17.387)

Introduction

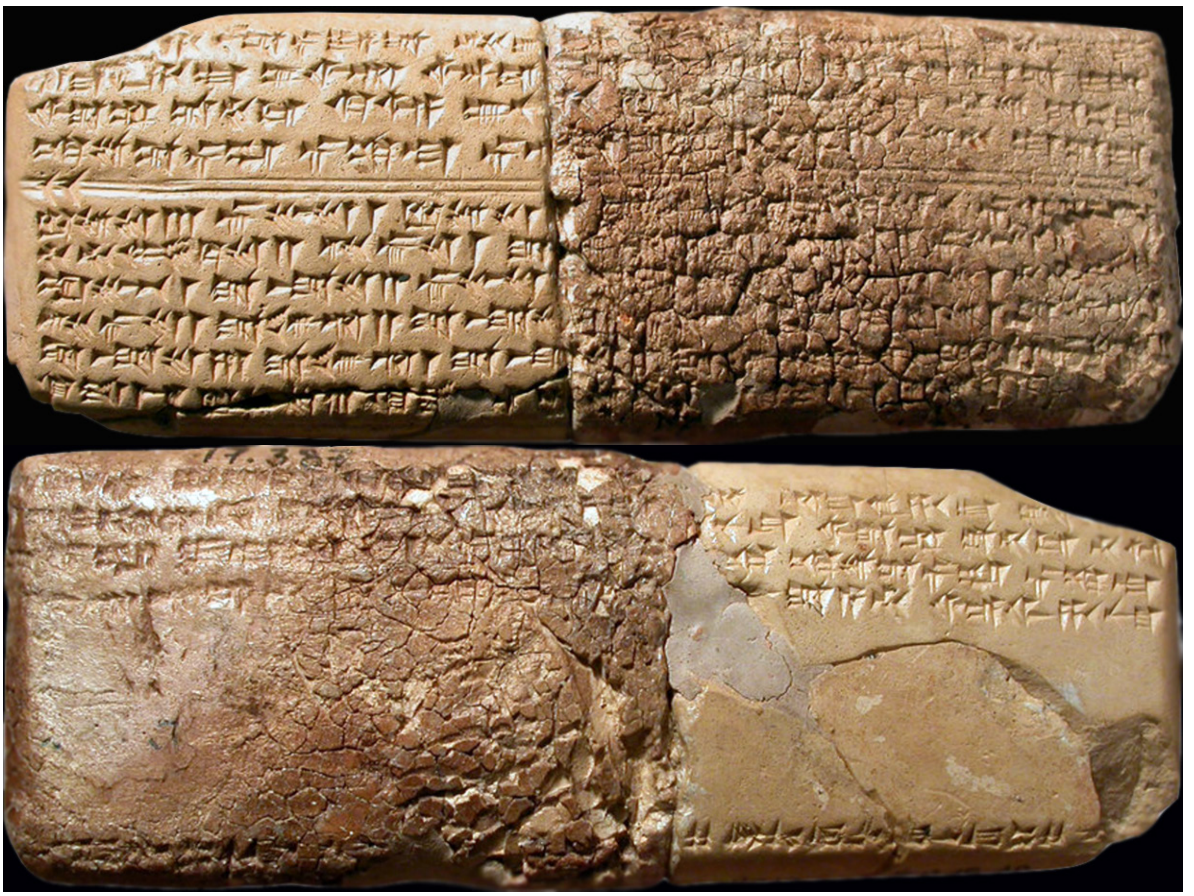


Figure 1. Tablet H6 = (RŠ13.30 + 15.49 + 17.387), Obverse and Reverse. This tablet is hosted at the National Museum of Damascus.

Introduction

Tablet H6 is part of a collection of about twenty-nine cuneiform tablets, all fragmented, unearthed during the pre and post war Missions at Ras Shamra, Syria, conducted by the French archaeologist Claude Schaeffer[1]. The tablets are written in Hurrian[2], an agglutinative language, with Babylonian signs (fig. 1). The scribes who wrote these texts were Babylonians as their name and usage of Hurrianised Babylonian suggests. The tablets would all have had the same rectangular shape. The writing is parallel to the longest

1 Nougayrol, J.; Boyer, G.; Laroche, E., Le Palais Royal d'Ugarit III et Planches, in *Mission de Ras Shamra*, Tome IV. Schaeffer, C. F-A (ed.) (Paris, 1955); Courtois, J-C.; Contenson, H., de; Kusche, A.; Vallois, H-V.; Ferembach, D; Dastugue, J.; Charles, R.; Clairmont, Ch.; Miles, G. C., *UGARITICA* IV, C. F-A Schaeffer, (ed.) (Paris, 1962); Nougayrol, J.; Laroche, E.; Virolleau, Ch.; Schaeffer, C. F-A. *UGARITICA* V, C. F-A Schaeffer, (ed.) (Paris, 1968)

2 Hurrian is an ergative agglutinative language which with Urartian, constitutes the Hurro-Urartian family. The Hurrians migrated to northern Mesopotamia around 2300 BC and had mostly vanished by 1000 BC. It was the language of the kingdom of Mitanni, in northern Mesopotamia, and was likely to be spoken at least initially in Hurrian settlements in Syria and notably Ugarit. It is generally believed that the speakers of this language originally came from the Armenian mountains and spread over southeast Anatolia and northern Mesopotamia at the beginning of the 2nd millennium BC.

side and is divided in three parts. The first varies with each tablet, but generally the text continues onto the obverse. The text usually consists of one paragraph which ends with a double line on which sits a double winkelhaken, at the beginning and at the end, on the obverse.

The second part spreads below the double line, with Hurrianised Babylonian musical terms which are followed, in most cases, by a number. Terms sometimes have pre or post-positioned adjectives. The first part gives the verse, the second music and rhythm. The third part is the colophon. It is written at the bottom edge of the tablet. Typically, its says that it is ' . . . a song in the pitch set of 'x', followed by an adjective and deities to whom the song is devoted. Follows the name of a scribe. Two of them are mentioned in the texts. There is a certain Ammurabi, another, *Ipšali*, and four Hurrian composers: *Tapšiḫun*, *Puḫiyanna*, *Urḫiya* and *Ammiya*. This is to our knowledge the first instance when composers are named, in world music history. Regrettably, H6 is the only tablet which came reasonably intact to us, reconstructed from three fragments: (RŠ13.30 + 15.49 + 17.387).

The colophon of tablet H6 is unequivocal:

It reads:[*an-nu*]-*ú za-am-ma-rum ša ni-id-kib-li za-l*[*u*]-*z*[*i ša* **DINGIR.MEŠ TA** ^{m}*Urḫiya*] *šu am-mu-ra-bi*, which translates as: 'This is a song in the scale of *nidqibli* a *zaluzi* for the gods, written by *Urḫiya* and composed by *Ammurabi*'.

Preliminary

Many have argued that this text notated the accompaniment of a song under the form of harmonic intervals and that the melody was made up from either the highest or the lowest pitch of the harmonic intervals of a heptatonic system. The numbers following the harmonic intervals indicated, according to them, the number of times the interval should be repeated. This unfounded and dogmatic postulation came from the same scholars' assumption that text CBS 10996 represented a series of dyadic harmonic intervals spreading within a heptatonic system. However, none of these hypotheses is supported by any evidence as I have proven in the previous chapters.

The colophon of the text says that it is a song: *an-nu-ú za-am-ma-rum.* The *Chicago Assyrian Dictionary* has the following definition for the term: *zamarū*, substantive; song, literary composition to be sung with or without instrumental accompaniment; from Old Babylonian on. However, there is absolutely no textual evidence to prove that the *zamarū*-song was systemically accompanied by any instrument. The *CAD* mentions a '...lamentation in the form of a song[3]'; '...songs do not please the lord (laments are not agreeable to him[4]'; '...the woman's song has changed in the city[5]'; '...song (in praise) of overlordship[6]'; '...I selected a song well suited for glorification[7]'; '..on the occasion when they (two named singers) performed a song before the king[8]'.

When the word *zamarū* implies, or is to be played by an instrument, it says so: '...songs for the *adapu*-instrument[9]'. But the notion of accompaniment is not defined. So, the word *zamarū* means 'melody', rather than song and when an instrument is not mentioned, the term means that the melody is sung, and not that it is sung to the accompaniment of any instrument.

3 Izi V 45f. (Lexical series izi = *išātu.*
4 SBH p. 21: 26f.
5 SBH p. 112r. 10f.
6 SBH p. 69r. 7f.
7 PBS I/I iv 78 and iii 46, see Falkenstein, ZA 49 85 n. 4.
8 Syria 20 106.
9 KAR 158r. 11.

The word *zamarū* is also a verb. The *CAD* defines it as, I quote: 'to sing (a song, with or without instrumental accompaniment)'. It adds *šuzmuru* '...to have singers (and other musicians) perform', but the locution '(and other instruments)' is only suggested by the *CAD* but is not written in any known text. Again, in the case an instrument is involved, it says so: '*za-ma-rum šá pít-ni*' which means, textually: 'melody-played *pitnu*-instrument', but not, as the *CAD* defines the verb: 'to sing to (the accompaniment of) a string instrument[10]'.

Therefore, in the context of H6, at least, it is a melody that is meant and not an accompaniment to which a melody is added, as many would have us believe. Therefore, scholars who have suggested that H6 was an accompaniment to which a melody was sung are falsifying, once more, the evidence, in order to make H6 fit with their flawed interpretation of text CBS 10996.

Furthermore, in the context of the present text, an instrumental accompaniment would be incongruous with the private nature of this young woman's prayer asking goddess Nikkal to make her fertile.

Liminary

We shall only discuss music notation since the lyrics are another matter requiring a separate work.

The colophon says that the song is in the pitch set of *nid kibli*. The nature of this set has been elucidated from three texts: CBS 10996, *nabnitu* xxxii, and UET VII, 74, already discussed in the present work. *Ni-id-kib-li* (Hurrian), *nīd qablim* (Babylonian) is an enneatonic descending pitch set: e-d-c-b-a-g-f-e-d. The values for melodic fifths and thirds are known from the aforementioned texts.

The interpretation is a straight forward operation. The music part of the tablet is composed of the names of melodic thirds and fifths and of numbers following each of them:

Line 5. [*qablite* 3] [*irbute* 1] [*qablite* 3] [*šaḫri* 1] [*titimišarte* 10] *uštamari*.....?

Line 6. [*titimišarte* 2] [*zirte* 1] [*šaḫri* 2] [*šaššate* 2] [*irbute* 3] [*šaššate* 2]

Line 7. [*umbube* 1] [*šaššate* 2] [*irbute* 2] [*nadqabli* 1] [*titur qablite* 1] [*titimišarte* 2]

Line 8. [*zirte* 1] [*šaḫri* 2] [*šaššate* 4] [*irbute* 1] [*nadqabli* 1] [*šaḫri* 2]

Line 9. [*šaššate* 2] [*šaḫri* 1] [*šaššate* 2] [*šaḫri* 1] [*šaššate* 2] [*irbute* 4]

Line 10. [*kitme* 2] [*qablite* 3] [*kitme* 1] [*qablite* 2] [*kitme* 1] [*qablite* 3]

Some numeric values could not be clearly read because of the damage to the tablet.

The melodic value for the melodic thirds and fifths in H6 is:

umbube = c-b-a-g-f; *nadqabli* = b-a-g-f-e; *qablite* = a-g-f-e-d; *kitme* = g-f-e-d-c; *titur qablite* = b-c-d; *titimisarte* = a-b-c; *zirte* = g-a-b; *šaḫri* = f-g-a; *šaššate* = e-f-g; *irbute* = d-e-f

With regard metrics, each melodic fifth has five pitch units and each melodic third has three. Remains to determine the length value of the numbers which follow. We take it that Hurrian composers would not have devised some obscure and complex method with which to express rhythm, after all, music indications are there to enlighten and not to obscure. We also assume, in the present interpretation, that the pitches of melodic thirds and fifths were all equal in length. Our contention is that the last member

10 A VIII/2:13.

of an interval was prolonged by a quantity defined by the number which follows. The only reasonable quantity would be:

♪♪♪1= ♪♪ ♩ ; ♪♪♪2 = ♪♪𝅗𝅥 ; ♪♪♪3 = ♪♪𝅗𝅥. ♪♪♪4 = ♪♪𝅝,
♪♪♪♪♪ 1 = 6; ♪♪♪♪♪ 2 = 8; ♪♪♪♪♪ 3 = 10; ♪♪♪♪♪ 4 = 12, etc.

When this method is applied to the intervals, and taking in consideration the damage of the tablet, lines 6 to 9 would have 36 beats each. Lines 6 and 10 would vary, as line 6 is introductory and line 10 jumps into line 6 as a catch-line for the repeat indicated both by the double winkelhaken and the lyrics. This regularity in the metrics of the piece further proves that the triads and pentads were melodic and not harmonic.

Line 5. [*qablite* 3] = 10 [*irbute* 1] = 4 [*qablite* 3] = 10 [*šaḫri* 1] = 4 [*titimišarte* 10] = 22 + [*uštamari*..... ?	= 50 (72?)
Line 6. [*titimišarte* 2] = 6 [*zirte* 1] 4 [*šaḫri* 2] = 6 [*šaššate* 2] = 6 [*irbute* 3] = 8 [*šaššate* 2] = 6	= 36
Line 7. [*umbube* 1] = 6 [*šaššate* 2] = 6 [*irbute* 2] = 6 [*nadqabli* 1] = 6 [*titur qablite* 1] = 4 [*titimišarte* 2] = 6	= 34?
Line 8. [*zirte* 1] = 4 [*šaḫri* 2] = 6 [*šaššate* 4] = 10 [*irbute* 1] = 4 [*nadqabli* 1] = 6 [*šaḫri* 2] = 6	= 36
Line 9. [*šaššate* 2] = 6 [*šaḫri* 1] = 4 [*šaššate* 2] = 6 [*šaḫri* 1] = 4 [*šaššate* 2] = 6 [*irbute* 4] = 10	= 36
Line 10. [*kitme* 2] = 8 [*qablite* 3] = 10 [*kitme* 1] = 6 [*qablite* 2] = 8 [*kitme* 1] = 6 [*qablite* 3] = 10	= 48 (72?)

Note that Line 5 could equal 72 on account of the unknown *uštamari* value; Line 7 could have misread a value and be 36; Line 10 could be 36 since the last interval [*qablite* 3] is a catch-line for line 5.

Conclusion

My interpretation of the musicological values of H6 leads to the score in figure 2. Now, this is what would be a 'tonal' interpretation. However, I do not mean that it is how it should be sung. The names of the intervals would have been 'modal' indications which stemmed from 'tonal' quantifications, or that 'modal' originals were translated as a 'tonal' expressions - which is my preferred option, as the 'modal' certainly preceded the 'tonal'.

I also take it that this notational method was far from being satisfactory and this is probably why it was not used outside Ras Shamra. It must have been experimental and certainly did not sprout from any reasoned epistemology. However, it was certainly much more advanced than Classical Greek and later Western Mediaeval notational systems. Nevertheless, it shows a persistent usage of consecutive and conjoined thirds (fifths being made of two conjoined thirds). This structure is typical of Near-Eastern modal semiotics as it is continued to this day with the Levantine Aramaic and Syriac traditions[11].

But the proof is always in the pudding, and in the Spring of 2011, in Damascus, at the Dar al-Assad Opera House, I presented my interpretation of H6 with some emotion, as the original tablet was resting only a few hundred metres away. I was quite anxious about reactions from Maqam masters present. To the contrary, some started to hum as if they had known the music from some distant memory, firmly anchored in their unconscious. Later, we engaged in enthusiastic discussions and the terms *bayati* and *Hijazi* recurred. These musicians naturally felt the need to emphasize certain pitches in the sets. Then, it became obvious that there is a direct link between Babylonian music theory, Hurrian songs and the Oriental Maqam.

11 Abou Mrad, Nidaa, *Éléments de Sémiotique Modale.* Geuthner, Paris (2016).

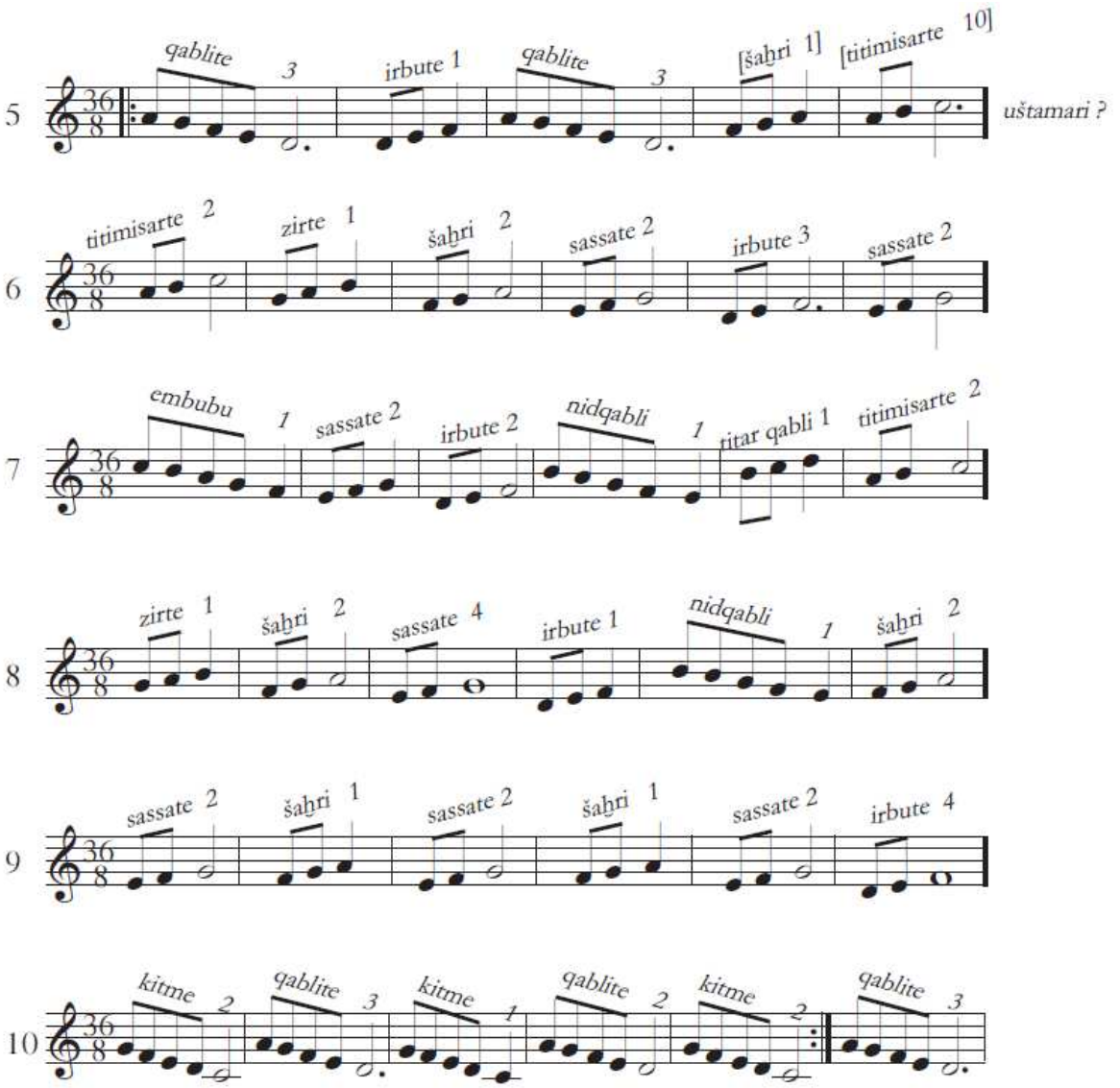


Figure 2. The author's tonal interpretation of H6.

BM 5217 + 66616

Figure 1. BM 65217+66616. Top, Obverse; middle, reverse; bottom, colophon.
With courtesy of the Trustees of the British Museum. Photograph by the author.

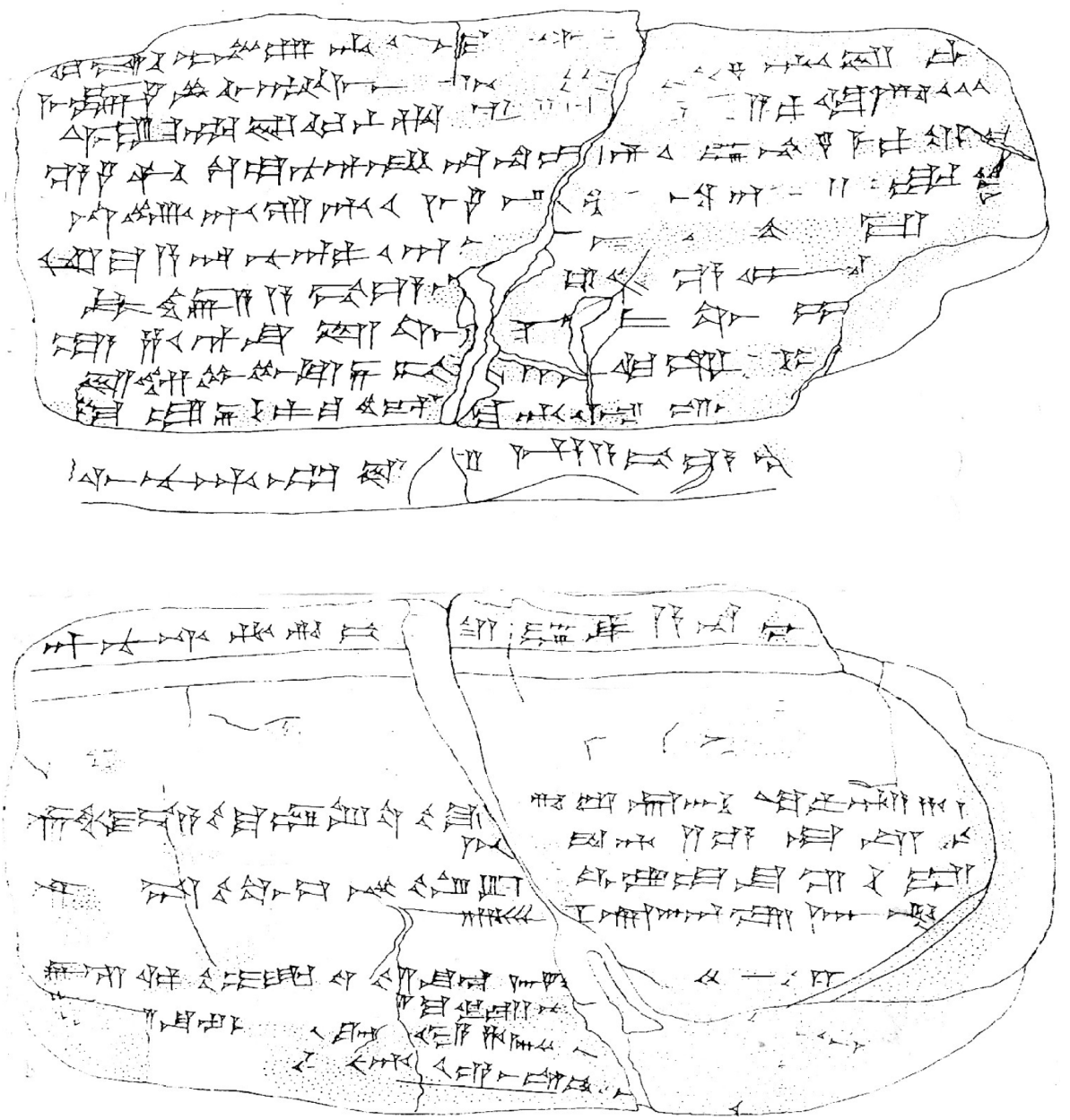


Figure 2. Kilmer's hand copy.

Introduction

This very difficult Neo-Assyrian text, perhaps from Sippar, was re-discovered at the British Museum by Leichty and Lambert who contributed to its reading with Oppenheim. Sollberger then granted Kilmer the privilege of studying it. It was subsequently published in 1984[1].

1 Anne Draffkorn Kilmer, A Music Tablet from Sippar(?): BM 65217 + 66616. *IRAQ* Vol. XLVI, Part 2, Autumn 1984, pp. 69-79.

Obv. 1. di-iš-šú *qud-mu-ú* ^{d}⌜en?-x x x⌝ [ ]
2. me-in *šá-mu-ši* ^{d}en-me-⌜šar?-ra?⌝ E[N? x] ⌜x x⌝-*šá-ti u* GIM pi?-⌜x⌝[ ]
3. *lim-mir-ka* GIM *di-pár-ri* ⌜*lu*? x x⌝ [x x] ⌜a-pa/hat KI re-eš [(x)]
4. e-šá *šal-šú qa-at-nu* DINGIR.MAH *ba-na-a*[*t*] DINGIR *u* LÚ *mu-šá-me-hat* UD? ⌜x te?⌝
5. *na-ṣir-ti kit-ti u me-šá-r*[*i*] kád?-[x]⌜na?⌝-an [x] ⌜x x⌝ *šar-ru*?
6. [l]am-ma *a-ba-nu* ^{d}PA *u* ^{d}L[UGAL?] ⌜x⌝ *ina* ⌜x⌝ x ib? [x x]
7. *pah-hi-ir a-a-bi-e-k*[*a*? x]kin? ⌜x⌝ e-mi ⌜x⌝ [x x]
8. i̯a *ha-an-šu* GIM *pi-*⌜*tu*⌝ lip-pi a[b?]
9. GIM *em-bu-bu* lu/DIB ni ⌜tàk?-x x⌝ ki-iš ⌜kin?⌝ ⌜x⌝ [x x x]
10. x(+) *ṣe-ni* šú PA *ma-hi-ra* [*l*]*a ti-ši* GUR? iš[ ]
lo.e. 11. *lim-nu-ti-ka* GIM [*ša*]*m*^{i}*-me a-a-bi-e-k*[*a*]

Rev. 12. *an-nu-ti ik-ri-bi* [*š*]*a* LÚ.NAR *a-na* ⌜x⌝ [x x x]

[traces in two erased lines]
13. (*a*) SA HUŠ.BI.A : *ma*-AZ-*ru-tú* : *š*[*a r*]*i-gim* SA.MEŠ-*šú la-pa-ti a-ha-m*[*eš*?]
(*b*) 1-*e*[*n*] *it-ti* 2-*e la qur-r*[*u-ub*?]
14. (*a*) SA DU : *pi-is-mu* : *ru-*⌜*tu*?⌝ [(x)] *pe-ta-at* ŠU.SI-*šú* RA-[(x)]
(*b*) *ina re-eš*? ⌜x⌝ SA.MEŠ AN.TA.MEŠ KAB! [(x)]
15. (*a*) SA SI.SÁ : *i-šar-tú* : 2? ŠU.SI.MEŠ *šá* ⌜x⌝ [x x] ⌜x⌝ [(x)] ⌜x⌝
(*b*) 2-*ma* KI.TA ⌜x x⌝ [ ]
16. (*a*) [SA? (x)] 2? ŠU.SI.ME[š (x)] ⌜x⌝ ma AN KI *a-ha-meš* [ ] ⌜x⌝
(*b*) ⌜x⌝[n]u-ti u/IO-*e ina* iš-N[E? x (x)] ⌜x⌝

Figure 2. Anne Kilmer's original transliteration.

Provisional translation

Obv.

1. one (=) fore (string), 'god[n?.....']
2. two (=) next (string), 'god Enmešarra?, Lord(?) of..... and like ..]
3. let shine for you, like a torch let?.....']
4. three (=) third-thin (string), 'great goddess, creatress of god and man who makes prosper.....,]
5. protectress of truth and justice.....']
6. four (=) Ea-creator (string), 'god Šullat and god Ṣaniš ?...in.....,]
7. gather your enemy [.....]
8. five (=) fifth (string), (is?) like 'open' (tuning/interval).....]
9. (is?) like 'reed-pipe' (tuning/interval)...., '.....]
10. .....the wicked?.....you have no rival.....,]
11. your evil ones like plants?, your enemies [you destroy?....']

Rev.
12. These are the adoration greetings which the musician for p[erforming ? .....]
==========
13. (a)SA ḪUŠ.BI.A: *mazrutu* (tuning): the sound of whose strings to play together
(b) one with the second not brought near?
14. (a) SA DU: *pismu* (tuning): *rutu*-span ? is open, his fingers.....
(b) at the head of... upper strings.....
15. (a) SA SI.SA: 'normal' (tuning): 2? fingers which.....
(b) twice, below.....
16. (a) [SA?] 2? fingers.....together.....
(b).....

Figure 3. Kilmer's provisional transliteration.

The obverse from line 13

The obverse mentions a list of five *ikribu* from lines 1 to 8. These are blessings or benedictions[2]. We note that there is a number followed by the name of a string and an incipit. Therefore the first eight lines of the present text reflect the first eight lines of YBC 11381. The first eight lines also reflect, to a certain extent, the first five lines of U.3011.

	a) BM 65217+66616		b) YBC 11381	c) U.3011	
	(S)**Sumerian**	(A)**Akkadian**	(S)**Sumerian**	(S)**Sumerian**	(A)**Akkadian**
l.1	**di.iš.šú**	*qud-mu-ú*	**sa.1 + incipit**	**sa.di**	*qud-mu-um*
l.2	**me.in**	*šá-mu-ši*	**sa.2 + incipit**	**sa.ús**	*šá-mu-šu-um*
l.3	**e.šà**	*šal-šú qa-at-nu*	**sa.3 + incipit**	**sa.3.sa.sig**	*šá-al-šu qa-at-nu*
l.4	**lam.ma**	*a-ba-nu*	**sa.4 + incipit**	**sa.4.tur**	**A.[DÙ]**
l.5	**i̯a**	*ḫa-an-šu*	**sa.5 + incipit**	**sa.di.5***	*ḫa-am-šu*

Figure 4. Comparison of the first five lines in BM 65217 + 66616; YBC 11381; U.3011. Note by numbering of the lines. BM 65217+66616 is text a), YBC is text b) and U.3011 is text c), henceforth. (S) stands for Sumerian and (A) for Akkadian.

Essentially the Akkadian is about the same in both texts. Mainly, the Sumerian differs.

What is the meaning of this, and are these differences of any importance? I would think that while BM 65217+66616 and YBC 11381 are list of incipits, U.3011 is a text of theory, and therefore it may be reasonable to assume that the latter would be more accurate than the former as shown below:

a)			b)	c)		
(S)		(A)	(S)	(S)		(A)
1 **di.iš.šú**	=	*qud-mu-ú*	**sa.1**	**sa.di**	=	*qud-mu-um*
2 **me.in**	=	*šá-mu-ši*	**sa.2**	**sa.ús**	=	*šá-mu-šu-um*
3 **e.šà**	=	*šal-šú qa-at-nu*	**sa.3**	**sa.3.sa.sig**	=	*šal-šú qa-at-nu*
4 **lam.ma**	=	*a-ba-nu*	**sa.4**	**sa.4.tur**	=	**A.DÙ**
5 **i̯a**	=	*ḫa-an-šu*	**sa.5**	**sa.di.5***	=	*ḫa-am-šu*

Figure 5. Simplified comparison of terms in the three texts.

2 See *CAD*, Volume I, pp. 62-6.

It makes little doubt that text c) is much more accurate in its definition for the first five string/pitches of the paradigmatic instrument/system. The limitation to five significant string pitches in text a) clearly shows that the enneatonic system was built up from, two conjoined melodic fifths. It will be further noted that the second fifth conjoined to the present one, has pitches listed in a straightforward manner as seen in the chapter dedicated to U.3011. In her 1984 article[3], Kilmer writes: '*The string name indicates one member of an interval (elsewhere denoted by a number-pair). But why*? Her question should have led her to the revision of her postulations.

The reverse

The reverse of this text is made up of sections.

The first section is represented by the persistent usage of the sign SA starting each of the Locutions.

In the chapter on CBS 10996, we have shown that **sa** defines a) a string, b) the location of an interval and c) the name (therefore the nature) of an interval.

Therefore, in the present text, the terms:

1) **SA ḪUŠ.BI.A** = *ma*-**AZ**-*ru-tú*
2) **SA DU** = *pi-is-mu*
3) **SA SI.SÁ** = *i-šar-tú*
4) [**SA**? (X)] =

There are not many options from which to chose: 1), 2) and 3) must indicate intervals. Since I have suggested that *pismu* would be the interval of the fifth, therefore **SA ḪUŠ.BI.A** = *ma*-**AZ**-*ru-tú* and **SA SI.SÁ** = *i-šar-tú*, can only indicate the interval of the third and the enneachord. I would propose that **SA ḪUŠ.BI.A** = *ma*-**AZ**-*ru-tú* is the third and that **SA SI.SÁ** = *i-šar-tú* is the enneachord (The set of *išartu* could be the generic term for enneachords ?). What would be the meaning of 4) [**SA**? (X)]? Kilmer suggests that **SA.MEŠ AN.TA.MEŠ** may be compared to Hurrian *ašḫu* and *turi*, 'upper' and 'lower', respectively. This would be indication the location of the three.

Now, the explanation for 1: '*the sound of whose strings to play together one with the second not brought near*' is cryptic to sat the least but could indicate the smallest interval of the system which is the third. For 2: '*is open, his fingers.....at the head of... upper strings.....*'.could indicate the first fifths at the treble. For 3: 'normal' (tuning): 2? fingers which.....twice, below.....' Could indicate two fifths amounting to an enneachord. Nothing can be said for 4.

I am aware that the Leiden Assyriologist and friend Theo Krispijn had developed an interpretation which he has not yet published. However, the short verbal explanation he gave during the Rotterdam conference in 2018, although interesting appeared as controversial as mine.

3 Kilmer, Anne Draffkorn, A music Tablet from Sippar(?): BM 65217 + 66616. *IRAQ*, Vol. XLVI, Part 2, Autumn 1984, pp. 69-79.

CONCLUSION

The eight cuneiform texts presented in this book are essential to our understanding of Semitic musicology[1]. They are all systemically related and show a continuous evolution, sprouting from the antediluvian collective unconscious, to our days.

It would be preposterous[2] to compare Ancient Semitic musicology to later Greco-Roman theories and even most absurd to analyse this music with Western methods. However, to this day, many musicologists remain staunch Western supremacists without even knowing that they are, as Mr. Jourdain '*...faisait de la prose sans le savoir*[3]'.

On the other hand, after the emergence of Abrahamic faiths, and from the second century AD, the West had been munificently enlightened by Eastern radiance – after all, the ecclesiastical modes had been conceptualised in Semitic Babylonia almost three thousand years before they infiltrated Western liturgy with the early proselytism of Levantine Christianity and with the proliferation of the most ancient of Jewish cantillations preserved by the Sephardim in the Synagogues of al-Andalus and of the Maghrib.

Ancient Near-Eastern pre-literate music did not come from numbers but from the triradicality of its languages translating spontaneously into the first three-pitched sonemes which conjoined into chains of thirds, to make music.

Semitic musicology grew organically and then, as the written language developed, it was enslaved into numbers. However, this arithmetization was restricted to the burden of tonality and probably relegated to the temple and its pomps. Nevertheless, this numeration led to a most sophisticated system probably using regular numbers from which sets where constructed and metabolised from dynamic to thetical status.

Folk, and probably court music, was left to the subtle wanderings of an embryonic modality which eventually hatched into the Maqam system as we know it today.

The texts studied in this volume show that in Mesopotamia during millennia religious and secular forms were played concurrently and it is possible that they never met since temple officials would have kept their music hidden well away from the populace only reminded of their servitude by the thundering sounds from the blows to gigantic drums. At courts, kings and other aristocrats were much more interested in the cultural diversity of music, and archives mention the mobility of beautiful singers and instrumentalists, of diverse genders, from the four corners of kingdoms, empires and beyond.

It is certain that the Ancient Near-East was the seat of the oldest and most sophisticated musical systems of all times, as proven by the cuneiform texts discovered since the late nineteenth century.

Essentials of Semitic Musicology

There is evidence that the most ancient and fundamental element of Semitic music theory was a group of three pitches, each separated from the other by an interval of probably a bit more or a bit less that a Just tone, but most probably not isotonic. Therefore, the size of the intervals varied to allow for

1 There are many other fragments with musical terms. However, none of them add significant new information to the contents of the eight essential texts in this volume.

2 In the proper meaning of the word, from Latin *praeposterus* 'reversed, absurd' (from *prae* 'before' + *posterus* 'coming after') + -ous.

3 A famous proverbial French locution with its sources in Molière's famous play from the end of the XVIII[th] century, '*Le Bourgeois Gentilhomme*' where Monsieur Jourdain discovered, to his greatest amazement, that he spoke in prose without even knowing that he did.

the expression of emotion, and with it the dynamic of the pitches. This led to a series of different groups known by specific names which survived in the Babylonian language, as we know them mainly from text CBS 10996. Religious songs using this tritonic[4] system are still practiced to this day in remote monasteries, such as at Tur Abdin[5], North of Mardīn in Turkey, but also in many other monasteries in the Levant where priests sing in the most ancient forms of the Aramaic and Syriac languages with a music certainly as old as the texts. This tritonic tradition is also particularly well-preserved in the Arabian peninsula with a 'song of the sea', for example, collected by Simon Jargy (1919-2001) himself born in Mardīn, uncanningly. Although this piece had been identified as pentatonic, I think it is tritonic.

With time, these tritonic groups, or melodic thirds, conjoined with others to form melodic fifths, each of them having its specific name. Aforementioned Neo-Babylonian text CBS 10996 lists seven ascending intervals of melodic thirds and seven intervals of descending melodic fifths. In turn, these melodic fifths conjoined to form eight, perhaps nine distinct melodic ninths or enneachords, each having its own name taken from the melodic fifths, although the names for the eighth and ninth sets are not known, or were perhaps qualified by special terms which we have not yet identified.

The descriptions laid out in text U.3011 suggest that prior to its enneatonic form, this music would have been pentatonic, as I have explained in the chapter devoted to this text and I would argue that this form was in constant usage alongside enneatonic diatonism and later with heptatonism as it is still in usage to this day.

The indications which are written on these extraordinary tablets and fragments are the oldest known treatises of musicology. They suggest that two concepts of music theory were superimposed. On the one hand, there was pitch quantification extrapolated from the philology and the layout of the texts, and further supported by regular numbers fitting with the philology, and amounting to what I would call the tonal aspect of Semitic musicology, and secondly, the fourteen intervals listed had names which added to the quantifications of intervals, suggesting the manner in which the tonal groups should be played. This was the source of an embryonic Maqam form, or modality as Western musicology would call it.

The Semitic musicology from the Babylonian Empire was essentially what I call linear. This means that the pitches were written one after the other, in a line, in the same order as the tuning tassels of the strings on the yoke of the lyre are arranged. Then a prodigious revolution happened, in the middle of the first millennium BC. Music theoreticians, inspired by the properties of the circle and of polygons inscribed within, created heptatonism as a consequence of bending linear enneatonism around a circle, making pitches at each end of the linear form, obsolete.

Some have argued dogmatically that Ancient Semitic music was never anything else than heptatonic because it could not be anything else. I am puzzled with this reasoning as no music system appears spontaneously in its final form. There would have been various attempts before it reached its 'perfection'. I am puzzled because the history of Semitic music theory is so clearly explained with the few texts that we have that I fail to understand the obstination at rejecting a theory of evolution which has been universally accepted in all other fields of scientific research, then, why not for Semitic music.

4 I am using the term 'tritonic' not in its common meaning of being a group of three contiguous Just tone intervals, but of a group of three pitches separated by unknown intervallic values.

5 British Library Sounds: Syriac Liturgical Music. Vespers in the Monastery of Deyrulzafaran. https://sounds.bl.uk/World-and-traditional-music/Syriac-liturgical-music/025M-C1658X0001XX-0001V0